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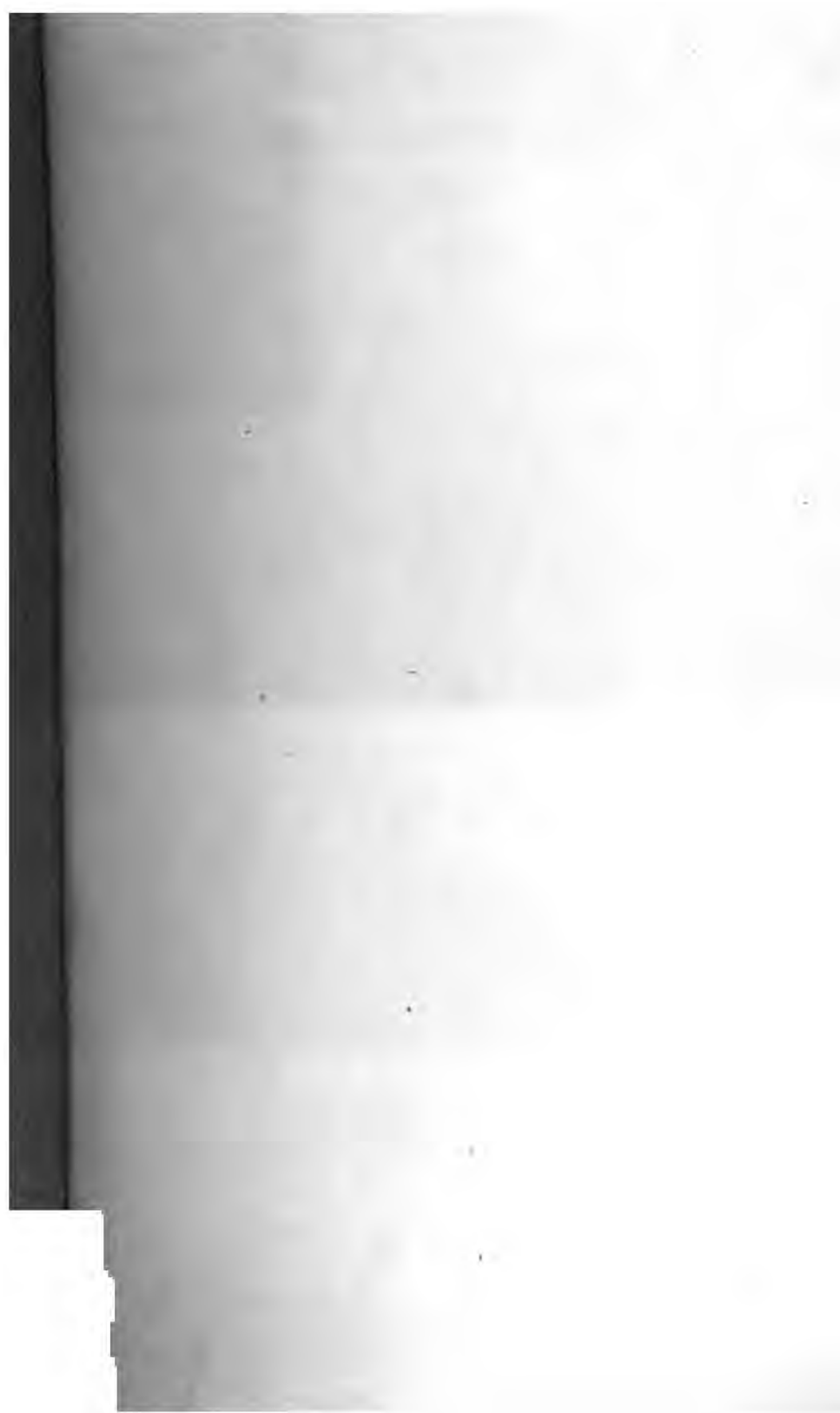
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City of Cambridge.

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1899.

ANNUAL REPORT

OF

THE WATER BOARD

TO

THE CITY COUNCIL,

FOR THE YEAR 1898.



Cambridge:
The Chronicle Press.
1899

☆ CAMBRIDGE PUB. LBRY

MOVING
ON
YSA

CAMBRIDGE WATER BOARD.

1899.

President.

JAMES M. W. HALL.

Members of the Board.

FRANK A. ALLEN	Term expires 1899.
GEORGE H. HOWARD	Term expires 1900.
JAMES M. W. HALL	Term expires 1901.
STILMAN F. KELLY	Term expires 1902.
WELLINGTON FILLMORE	Term expires 1903.

WALTER H. HARDING, Clerk.

Superintendent of Works.

EDWIN C. BROOKS.

Water Registrar.

WALTER H. HARDING.

Trustees of Sinking Fund of Water Loan.

**THE MAYOR, CITY TREASURER, AND PRESIDENT
OF THE COMMON COUNCIL, ex officio.**

CAMBRIDGE WATER BOARD.

Date of election and length of service of members, 1865-99.

CHESTER W. KINGSLEY	1865-1894	
JOHN SARGENT	1865-1871	
A. K. P. WELCH	1865-1871	
ROBERT DOUGLASS	1865-1871	
SAMUEL SLOCOMB	1865-1876	
Z. L. RAYMOND	1871	
HENRY L. EUSTIS	1871-1885	
J. WARREN MERRILL	1871-1881	
GEORGE P. CARTER	1871-1883	
JOHN H. LEIGHTON	1876-1879	
KNOWLTON S. CHAFFEE	1879-1889	
JAMES M. W. HALL	1881-	(Now in Office.)
LEANDER M. HANNUM	1883-1884	}
	1885-1893	
JOHN F. O'BRIEN	1884-1895	
GEORGE H. HOWARD	1889-	(Now in Office.)
E. BURT PHILLIPS	1893-1896	
STILLMAN F. KEELEY	1894-	(Now in Office.)
FRANK A. ALLEN	1895-	(Now in Office.)
WELLINGTON FILMORE	1896-	(Now in Office.)

Presidents of the Board.

J. WARREN MERRILL	1865-1867
EZRA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-

REPORT OF THE CAMBRIDGE WATER BOARD.

CAMBRIDGE, December 20, 1898.

To the Honorable, the City Council of the City of Cambridge.

The annual report of the Cambridge Water Board for the year ending November 30, 1898, is herewith submitted for your careful consideration.

Last year we called attention to the fact of the completion of our work in the development and enlargement of the Stony Brook system.

When the City Council, on October 27, 1897, celebrated the completion of that work — which embraced the new high service reservoir at Payson Park, the new twenty million gallons pumping engine, and the two storage basins at Hobbs Brook — they believed at a completed system, but not a complete supply of water to properly furnish that system, and the natural question of what came to many minds as to the probability of the large lower basin being filled within a reasonable time. Our part of the work had been done. How long should we have to wait for what was so necessary to really complete the work — an ample supply of water?

It should be remembered that before the Water Board decided to construct a large basin at Hobbs Brook they had accumulated sufficient data from actual observation and measurements to determine that with an average yearly rainfall, about 2,500,000,000 gallons of water per year could safely be depended upon as a normal supply from Hobbs Brook, independent of Stony Brook, or a full year's supply for our City, based on an average daily use of 7,000,000 gallons — which was about the consumption the last year, and should a rainfall con-

siderably above the average occur, we could store sufficient water to fill the basin and rely upon Stony Brook proper for the City supply during such period of accumulation. As no unusual yearly rainfall had occurred since 1890, and as 1888 and 1889 were the last years of extraordinary rainfall, we reasonably assumed by the rule of averages that 1898 would be likely to witness an abnormal rainfall. Hence the finishing work of riprapping the new basin was pushed late last Fall, and by somewhat vigorous measures the contractor was forced to deliver the basin to our care before the Winter storms set in.

On December 16, 1897, the gates at Winter Street dam were shut and the large lower basin began to be filled. The upper, or smaller, basin was already full. Beyond our most sanguine expectations have been the results. The rainfall the last year has been 52.42 inches. As a result, in less than eight months, or on August 21, 1898, the large basin was full to overflowing so that it became necessary, on November 1, 1898, to remove the top flash boards in the gate house at Winter Street dam to reduce the over supply and although eight inches of water stored were thus given liberty, yet little decrease was effected. The basin has continued nearly full—grade 181—and today the water stands at 180.93 with thirty-six million of gallons per day running to waste at Winter Street dam. As one inch of water in this basin means 15,000,000 gallons, it can readily be seen what an enormous amount of water Hobbs Brook is capable of storing and supplying; and confirms the wisdom of the plans made for the development of our Stony Brook system rather than a union with the very costly and to us less satisfactory Metropolitan water system.

Whatever other cities or towns may or do need as to the Metropolitan supply, Cambridge does not, and with proper care and utilization of what she has within reach will not need any other source of supply than Stony Brook for many years to come.

Should it ever be necessary to supplement the system as now completed and store an additional supply, it could be secured by building a dam at or near Beaver Pond, the head of Stony Brook, and should our City introduce the dual system—utilizing the waters of Charles River for purposes other than domestic—to

which for the last two years we have called the attention of the City Council, it seems reasonable to believe that we shall have a little water Cambridge is likely to require for over a generation, especially if, as will probably be the case at some future time, water is all furnished through meters at meter rates.

The amount of water that has run to waste the last year over Stony Brook spillway and into Charles River is 5,704,600,000 gallons, which is equal to two years' supply, and indicates the possibilities of Stony Brook and its tributary, Hobbs Brook, as a water supply, should it be necessary at some future time to construct another storage basin. Since the connection was first made of Stony Brook and Fresh Pond, November 6, 1887, there have gone to waste into Charles River 62,608,186,076 gallons of water, or twenty three years' supply, based on present rate of consumption. And this is in addition to what our City has used.

The consumption of water has increased the last year 261,592 gals. per day over that of the preceding year. This is owing largely to the increased pressure because of the entire City being supplied from Payson Park high service reservoir. As we have in previous reports suggested when the daily consumption amounts to 8,500,000 gallons the capacity of our present delivery pipe connecting Stony Brook with Fresh Pond will have reached its limit and another pipe should be laid large enough, with the present pipe, to keep Fresh Pond full and equal to any future demand for our water-takers and equal to the largest daily supply of which our Stony Brook system is capable of furnishing. The cost of this will be about \$400,000, and is likely to be needed for many years, although it is hoped it may not be necessary until our water receipts shall be considerably in excess of the present revenue.

In this connection we suggest that care should be exercised by the City Council not to reduce existing water rates. Should water rates not be sufficient to meet fixed charges and other necessary expenditures, the deficit must be provided from the general tax levy. This has never been necessary so far in the history of the water works. It is hoped it never will be. Up to this time our taxpayers have never been assessed one dollar to pay for the cost of the water works system other than what is

paid by them for the use of water. There is nothing in the domestic expenses of our citizens where they receive so much for so little as in the water they use.

Our financial statement this year is of more than ordinary interest because we can now present with approximate correctness the total cost of the development of the water system now completed and paid for, after six years from its commencement in 1893.

The total cost of the water works up to November

ber 30, 1892	\$3,195,214.38
And up to November 30, 1898	5,602,364.56
	<hr/>
Increase in six years	\$2,407,150.18
Deduct amount expended for General Construction	160,165.97
	<hr/>
	\$2,246,984.21

This amount (\$2,246,984.21) represents the cost of the work the last six years, as already described.

In detail, the cost of each department of the new work has been as follows:—

1. Payson Park high service reservoir, including engineering and police service	\$286,947.65
2. Land for same (11 acres)	37,784.25
3. New pumping engine, including foundation, inspection and Mr. Leavitt's services	138,501.42
4. New boilers, alteration to engine house and boiler room, including services of Mr. Leavitt	58,475.24
5. New forty-inch main, including Venturi meter	203,229.93
6. Construction of Hobbs Brook basin, upper and lower	785,869.06
7. Dams at Winter and Lincoln Streets	156,079.58
8. Land taken for Hobbs Brook reservoir (1,000 acres)	233,914.65
9. Fresh Pond land	156,873.68
10. Fresh Pond improvements	189,308.75
	<hr/>
	\$2,246,984.21

Of the entire cost of the water works to date (\$5,602,364.56) \$3,242,199.00 are represented by out-standing unmatured bonds. The balance has been paid, and in addition is the amount paid into the sinking fund to redeem bonds not yet matured.

The value of the sinking fund we are not as yet able to state accurately, as we have not been able to get the figures from the City Treasurer. It should be about as follows:

Amount in fund November 30, 1897	\$464,118.38
Earnings in 1898	18,647.83
Amount paid into sinking fund November 30, 1898	103,656.00
	\$586,112.21
Deduct bonds paid maturing July 1, 1898	12,500.00
	\$573,612.21

From this \$573,612.21 must be deducted the premiums paid for bonds purchased by the Commissioners during 1898, the amount of which premiums we have no knowledge of.

There are no more bonds maturing until November 1, 1906, and no large amounts until 1910. For detailed financial statement we refer you to the annual reports of the Registrar and Comptroller on Accounts.

The income from water rates has been disappointing, so that the year closes with a small deficit, although we have in every department kept within our appropriations except abatement and refund, which cannot ever be accurately estimated.

The unusually small number of new houses erected the past year, the reduced receipts because of the extension of the water system and the reduction in meter rates made by the City Council early in the year have all contributed to this result. Besides these causes our City receives no income from the S. & C. Canal, where, until lately, we received \$6,000 per year.

Renewals and Construction.

During the four past years, in anticipation of the increased pressure from high service, all of the old cement-lined pipe and considerable of the old iron pipe have been removed, and the entire system is now in better condition than ever before. De-

tails of this are given in the Superintendent's report. The amount paid for renewals the last four years is \$142,000.00. It is not probable that much will be needed for further renewals for some time.

During the year, Mr. E. C. Brooks, who, since Mr. Harrington's death, has been Acting Superintendent, was chosen Superintendent and Mr. E. I. Harris appointed Chief Engineer to succeed Mr. Brooks.

Our City is to be congratulated in having men of such ability in charge of such responsible positions.

Pumping Station, Fresh Pond.

During the early part of the year, the new pumping engine, after being fully tested, was accepted by Mr. Leavitt, who planned it for the City, and we are assured that it is the finest and most complete pumping engine of its character in the United States. It is proving all that was anticipated, and should be, for many years, a source of pride and congratulation for the perfection of its mechanism and the economical results secured.

The two ten million gallons pumping engines have been altered during the year so as to be auxiliary to the large engine in case of necessity. The high service engines of 2,000,000 and 1,000,000 gallons formerly supplied the standpipe; the smaller of these two will be sold.

With the new floor laid during the year and the walls painted, and new front door placed, the engine house is in better condition than ever before and with the new engine in operation it is a sight which our citizens should not fail to see and will be well repaid for inspecting.

Fresh Pond.

No work was done around the pond this year until late in the Fall because of failure of the City Council to appropriate anything for this purpose until too late to be of much service.

It can hardly be considered wise or economical to allow the incomplete work on the westerly side of the pond to remain in an unfinished condition. It should be taken hold of promptly another year when the season opens and a reasonable appropriation made to properly complete it.

The borders of Fresh Pond will surely be one of the most attractive features of our park system in the future, and should be laid out in harmony with the other parts of the park system, although from their location they are properly under the care of the Water Board.

An cost of the land and its improvements have been met or will be met from water receipts, either direct or through bonds raised by certain water receipts. It is a question to be now considered whether a permanent improvement like the work referred to should not in part at least be provided for by bonds.

The last unsettled claim for land taken around Fresh Pond (the Gray land) has recently been adjusted by compromise, after two years' delay.

The Fitchburg Railroad, early in the year, removed their tracks from the Fresh Pond area and payment was made as indicated in our last report.

We are pleased to include these two items among the completed facts of the last year.

Cambridge Reservoir.

As the old reservoir has not been used for nearly a year, and as this site is valuable for residential purposes, some steps should be taken during the coming year to dispose of it and the proceeds received in the sinking fund of water works, as the City will not occupy the property further for water purposes.

Payson Park Reservoir.

The grading has been completed during the year, and the surroundings now are finished other than some little grading and the completion of Elm Street, through which run the forty inch supply and delivery mains. This work is to be done in connection with the Payson Park Land Trustees and only awaits their arranging with the abutters for the Water Board to do its part.

Stony Brook Reservoir.

The Lake View is in fine condition, and the keeper, Mr. Silas Baxter, has been vigilant and faithful, as usual, in his duties at this very important point in the water works system.

It is a position requiring constant watchfulness, being the

main artery of our water supply, as it is from this point the pipe starts that connects Stony Brook with the City of Cambridge.

Hobbs Brook Reservoir.

The keeper's house, corner of Lincoln Street and the County Road, was completed late last year and Mr. J. E. Bryant was appointed keeper—his duties embracing the care of the upper and lower basins. The duties have been faithfully and satisfactorily attended to. The condition of the basin is excellent and the cleanliness of the shore and protection from washing away in time of high winds and waves fully justify the action of the Water Board in having the riprapping thoroughly done before allowing water to accumulate in the basin.

The water in the basin having been so quickly stored, no vegetable growth developed nor is likely to, and hence the conditions, as Professor Sedgwick recently remarked, are "well nigh perfect," and the water being well settled before it leaves the basin must be as good water as any city in New England has.

During the year, Dr. Greenwood, of Waltham, our medical inspector, has made a careful survey of Hobbs Brook and all its tributaries and reports everything in excellent condition and the sources to be so located as to almost preclude any possibility of defilement.

He has also made a thorough inspection of Stony Brook proper and its tributaries. Several cases from which there might possibly enter some objectionable matter have been attended to, and early in the Fall the members of the Water Board made a personal examination, with him, of all these points and found them satisfactory.

When we contrast the present conditions of Stony and Hobbs Brooks with what existed when we first commenced taking water from that source we are sure that the water this year is purer than ever before and our citizens need not resort to the use of so-called spring water for their drinking supply.

We believe if the State Board of Health will sustain the protective law as related to water supplies passed in 1897 no apprehension need exist as to any future defilement.

During the early part of last Fall information came to us from reliable sources that a plan was formulated for the erection of a

large hog slaughtering establishment close to Cherry Brook—an important affluent of Stony Brook in South Lincoln.

A conference was held with the Selectmen and local Board of Health of Lincoln with the result of a joint petition of Cambridge and Lincoln, in which Waltham, Lexington and Weston are interested, to the State Board of Health, requesting action on their part in conformity with the act of 1897 to prevent the erection of the slaughter house. Subsequent to this a special town meeting was called in Lincoln, where, by a decided majority, a license was refused to the petitioners.

It is hoped the State Board of Health will realize the gravity of such cases and in the spirit and letter of the act of 1897 protect the citizens of this Commonwealth against all such plans which are a menace to the public health and comfort.

It may be well to secure additional legislation the coming Winter which shall further discourage all such plans that are made with little regard to public health.

The Water Board, recently, in furtherance of cooperation with the State Board of Health decided to purchase the Sargent place in South Lincoln, as being the only solution of what has been, since we connected with Stony Brook, a difficult problem to solve. An appropriation will soon be asked for this.

There now remains unsettled of the Hobbs Brook land taking some additional water cases, settlement for which will probably not exceed a few hundred dollars, and this will complete the settlement for lands taken at Hobbs Brook.

Office Work.

The Water Registrar, Mr. W. H. Harding, who is also Clerk of the Board, has carefully attended to the duties of his department and with entire satisfaction to the Board.

Although the work of this office has so largely increased during the last four years, only two additional assistants have been appointed. The cost of the office has increased but fifteen hundred dollars in five years. The employees have been faithful, attentive and conscientious, as always.

The Assistant Superintendent, Mr. C. B. Parker, has attended to his varied duties with promptness and efficiency, as usual.

Most of our citizens are not probably aware that the calls on

the Water Department are similar to those on the Fire Department. Any break or leak must be responded to at any and all times, night or day, in all weathers, no matter what the exposure is. We perhaps too seldom recognize the value to our comfort and safety of the men who, occupying humble and often unnoticed positions, do such excellent service with pick and shovel, often involving great discomfort and always hard manual labor.

The faithful services of our permanent employees are cordially commended.

New Stable.

It became necessary the past year to build a new brick stable at the Auburn Street pipe yard and to make some changes in the house of the keeper there, as well as other changes in the line of economical handling of supplies which the old buildings do not afford. The work has been well done at a cost of about seven thousand dollars, and is a credit to the City. The Superintendent's report refers to this in detail.

We are glad to refer to the cordial relations that have existed between the Water Board and the Chief Executive of our City and the City Council—being a continuation of the unbroken and mutually pleasant relations and confidence that have ever marked the history of the Water Board and its relation to the Mayors and City Councils of our City.

The harmony that has existed in the councils of our Board with so many perplexing and important problems to solve during the last four years—the most important four years of its history—is one of the compensations for the service rendered the City—a service that will, we are confident, more and more commend itself to our fellow citizens by the results already achieved and the possibilities of the future.

JAMES M. W. HALL,
WELLINGTON FILLMORE,
STILLMAN F. KELLEY,
FRANK A. ALLEN,
GEO. H. HOWARD,
Cambridge Water Board.

REPORT OF THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 7th, 1898.

To the Cambridge Water Board:

Gentlemen: In compliance with the requirements of the City Ordinance, I present the thirty-fourth annual report of the operations of this department, showing the receipts, expenditures and statements, together with a statement of the number of water-takers etc., for the year ending November 30, 1898.

Amount of bills remaining unpaid November 30, 1897

Water Rates	\$22 36
Meter Rates	10 1
Supplies and repairs	666 75
Light and fuel	122 00
Rent	76 1
Carriage	20 00
Maintenance of plant	22 0
Construction of plant	100 0

Amount of bills received by the Treasurer for the year ending November 30, 1898

Water Rates	\$225 20 00
Meter Rates	9 66 1
Supplies and repairs	666 75
Light and fuel	70 0
Rent	66 1
Carriage	20 00
Maintenance of plant	22 0
Construction of plant	00 0

Total amount received for the year ending November 30, 1898

Amount of bills received for the year ending

Water Rates	\$225 20 00
Meter Rates	9 66 1
Supplies and repairs	666 75
Light and fuel	70 0
Rent	66 1
Carriage	20 00
Maintenance of plant	22 0
Construction of plant	00 0

WATER REGISTRAR.

Rents	353.01
Maintenance account	1,331.46
Construction account	693.99

There has been abated:—

Water rates, off and on, seals and rents	\$5,262.79
Supplies and repairs	18.30
Construction account	22.80
Maintenance account	13.50

There remains unpaid:—

Water rates	\$154.85
Meter rates	1,176.42
Supplies and repairs	1,270.24
Off and on	124.00
Seals	10.75
Maintenance account	79.15
Construction account	76.38
	<u>\$317,770.94</u>

Expenditures.

Construction account (general)	\$26,007.47
Construction account (Fresh Pond Reservoir)	5,734.83
Construction account (Hobbs Brook Reservoir)	182,619.92
Construction account (Payson Park Reservoir)	39,787.66
Construction account (Fresh Pond land)	62,288.57
Maintenance account (general)	28,736.52
Maintenance account (office)	5,739.26
Maintenance account (pumping)	14,136.52
Maintenance account (renewal of mains)	15,534.91
Maintenance account (Stony Brook Reservoir)	1,310.98
Maintenance account (Hobbs Brook Reservoir)	859.97
Maintenance account (Payson Park Reservoir)	940.09
Maintenance account (Fresh Pond Reservoir)	8,853.51
Supply account	5,064.46
	<u>\$397,614.67</u>

Abatements.

Water rate bills to the amount of	\$5,262.79
Maintenance bills to the amount of	13.50
Supply and repair bills to the amount of	18.30
Construction bill to the amount of	22.80
	<u>\$5,317.39</u>

Refunds.

Water rates to the amount of	\$3,163.74
Which amount deducted from the receipts	300,293.52
Leaves net receipts for water	<u>\$297,129.78</u>
Add off and on, rents, seals and maintenance account	2,538.22
Makes net receipts of "rates, fines, etc."	<u>\$299,668.00</u>

Off and On.

Water has been shut off for non-payment of rates or per order on account of vacancy, and seals have been applied to fixtures by request of owners, as follows:—

Water shut off in 1898	687
Supplies let on, shut off in 1898	529
Supplies let on, shut off in previous years	98
New supplies let on	249

WATER REGISTERS.

17

Sum. was applied to Rates in 1888	1 27
Sum. was removed put on in 1888	65
Sum. was removed put on in previous years	68

This year the City of Somerville has taken on her water system which was formerly supplied by the City of Cambridge, and the resultant effect of a shrinkage of about six thousand dollars in her receipts.

Statement of the yearly revenue received from water rates since the purchase of the works by the City.

From April 1, 1888, to December 1, 1888	\$21,871.19
From December 1, 1888, to December 1, 1889	20,973.37
From December 1, 1889, to December 1, 1890	22,723.42
From December 1, 1890, to December 1, 1891	23,767.42
From December 1, 1891, to December 1, 1892	24,169.39
From December 1, 1892, to December 1, 1893	25,086.95
From December 1, 1893, to December 1, 1894	25,762.45
From December 1, 1894, to December 1, 1895	27,391.39
From December 1, 1895, to December 1, 1896	26,117.32
From December 1, 1896, to December 1, 1897	25,434.37
From December 1, 1897, to December 1, 1898	26,089.37
From December 1, 1898, to December 1, 1899	27,168.70
From December 1, 1899, to December 1, 1900	26,843.19
From December 1, 1900, to December 1, 1901	27,643.91
From December 1, 1901, to December 1, 1902	26,681.99
From December 1, 1902, to December 1, 1903	27,325.00
From December 1, 1903, to December 1, 1904	27,682.73
From December 1, 1904, to December 1, 1905	27,439.00
From December 1, 1905, to December 1, 1906	27,941.00
From December 1, 1906, to December 1, 1907	28,326.37
From December 1, 1907, to December 1, 1908	28,544.24
From December 1, 1908, to December 1, 1909	29,074.47
From December 1, 1909, to December 1, 1910	29,476.04
From December 1, 1910, to December 1, 1911	29,116.37
From December 1, 1911, to December 1, 1912	29,116.37
From December 1, 1912, to December 1, 1913	29,116.37
From December 1, 1913, to December 1, 1914	29,116.37
From December 1, 1914, to December 1, 1915	29,116.37
From December 1, 1915, to December 1, 1916	29,116.37
From December 1, 1916, to December 1, 1917	29,116.37
From December 1, 1917, to December 1, 1918	29,116.37
From December 1, 1918, to December 1, 1919	29,116.37
From December 1, 1919, to December 1, 1920	29,116.37
From December 1, 1920, to December 1, 1921	29,116.37
From December 1, 1921, to December 1, 1922	29,116.37
From December 1, 1922, to December 1, 1923	29,116.37
From December 1, 1923, to December 1, 1924	29,116.37
From December 1, 1924, to December 1, 1925	29,116.37
From December 1, 1925, to December 1, 1926	29,116.37
From December 1, 1926, to December 1, 1927	29,116.37
From December 1, 1927, to December 1, 1928	29,116.37
From December 1, 1928, to December 1, 1929	29,116.37
From December 1, 1929, to December 1, 1930	29,116.37

Comparative Statement.

	1897.		1898.	
CONSTRUCTION ACC'T (PAYSON PARK RESER- VOIR)				
<i>Received.</i>				
From bonds issued .	\$75,000 00		\$45,000 00	
From premium on bonds sold	3,000 00		2,554 00	
Overtime on pay rolls etc.			41 00	
Sale of transit and old material . . .	419 86	\$78,419 86		\$47,595 00
<i>Expended.</i>				
Construction of reser- voir, pumping en- gine, etc.	\$70,760 24		\$39,787 06	
Balance of appropri- ation	7,659 62		7,807 34	
		\$78,419 86		\$47,595 00
CONSTRUCTION ACC'T (HOBBS BROOK RESER- VOIR)				
<i>Received.</i>				
From bonds issued .	\$400,000 00		\$187,000 00	
From premium on bonds sold	7,672 00		5,055 00	
From sale of grass, feed, old material, etc., etc.	691 55	\$408,363 55	576 26	\$192,631 26
<i>Expended.</i>				
Construction of reser- voir, land settle- ments, etc., etc. .	\$398,187 52		\$182,619 92	
Balance of appropri- ation	10,176 03		10,011 34	
		\$408,363 55		\$192,631 26
CONSTRUCTION ACC'T (FRESH POND LAND).				
<i>Received.</i>				
From bonds issued .			\$63,000 00	
From premium on bonds sold			3,486 00	\$66,486 00
<i>Expended.</i>				
Settlements with John C. Gray and Fitch- Railroad, etc. . . .			62,288 57	
Balance of appropri- ation			4,197 43	\$66,486 00

WATER RESISTANCE:

190

Comparative Statement (Continued)

1960			
General Fund			
From State	100.00	100.00	
From Local	50.00		50.00
From Federal			
From State	100.00		
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From Local	50.00		

Comparative Statement (Continued).

1897.	Maintenance account, excess of receipts	\$20,303 88	
	Supply account, excess of receipts . . .	1,136 13	
	Excess of total receipts over total expenditures	\$21,440 01	
	Transferred to Construction Account (Fresh Pond Reservoir)	16,972 74	
	Balance carried to Sinking Fund		\$4,467 27
1898.	Maintenance Account, excess of expenditures	\$4,407 79	
	Supply Account, excess of receipts . . .	971 57	
	Excess of total expenditures over total receipts		\$3,526 22

By comparing the above table of receipts from water rates it will be seen that our annual average increase has fallen off in 1898, as compared with recent years.

The loss in revenue is due, principally, to the small number of dwellings erected during the last year, the few fixtures added in dwellings already erected, the abatement of a large number of hose charges on account of the wet season, and the setting of meters to cover domestic consumption, and a reduction in the rates for metered water.

The only water rate charges made in 1898 remaining unpaid are for additional fixtures and for metered water, to the amount of \$963.17 out of a total of \$306,000.00. Of the amount unpaid (\$963.17) nearly seven hundred dollars (\$700.00) is due from a corporation whose affairs are in the hands of assignees and the court has issued an injunction restraining the City from collecting the bill by the ordinary methods. Deducting this bill from the total amount unpaid leaves water bills remaining unpaid to the amount of two hundred sixty-five dollars (\$265.00).

In addition to the manufactories, etc., supplied through meters, water is supplied to 19,892 families, 892 stables, with 3,107 horses and 210 cows; 334 shops; 821 stores and offices, by the following fixtures, viz:—

23,751 faucets,	6 hopper closets,
8,193 wash basins,	90 urinals,
10,150 wash tubs,	17 yard hydrants,
6,945 bath tubs,	4 fountains,
374 slop closets,	45 tumbler washers,
19,596 pan closets,	1,926 hand hose,
10 motors.	

1. a.

- 2. The system is limited to the water premises.
- 3. The system is
- 4. The system is limited to the water premises.
- 5. The system is limited to the water premises.
- 6. The system is limited to the water premises.

The system does not include those in schoolhouses, city buildings, police stations and other City buildings, or where the water is covered by meter.

The system is used to house inspection of the service pipes and fixtures on the premises of the water takers has been made with the most satisfactory and remunerative results.

Respectfully submitted,

WALTER H. HARDING,

Register.

ANNUAL STATEMENT

OF THE

WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DEC. 1, 1898.

Water rates unpaid November 30, 1897	\$772.01
Supplies and repairs unpaid November 30, 1897	1,444.28
Off and on bills unpaid November 30, 1897	122.00
Seals unpaid November 30, 1897	14.25
Rent unpaid November 30, 1897	26.66
Maintenance account unpaid November 30, 1897	32.50
Construction account unpaid November 30, 1897	168.03

\$2,579.73

Bills placed in hands of City Treasurer for collection from December, 1, 1897, to December 1, 1898:—

Water rates from annual ledgers	\$214,994.50
Water rates from fractional ledger	10,236.46
Water rates from meter ledger	80,846.11
Off and on water	726.00
Rent	326.35
Seals	164.75
Supply and repair bills	5,890.29
Maintenance account	1,391.61
Construction account	625.14

315,191.21

Total bills **\$317,770.94**

There has been collected:—

Annual ledgers	\$211,337.02
Fractional ledger	9,109.12
Meter ledger	79,847.38
Off and on ledger	691.00
Rent ledger	353.01
Seal ledger	162.75
Maintenance account	1,331.46
Construction account	693.99
Supply and repair account	6,086.03

Total collections **\$309,561.76**

There has been abated:—

Water rates, off and on, and seals	\$5,262.79
Maintenance account	13.50
Supply account	18.30
Construction account	22.80

\$5,317.39

STATEMENT OF THE WATER REGISTRAR.

23

Amounts received and collected			
By metering on	\$ 221 12		
Charges and repairs	1 27 36		
Of water	124 00		
Donations			
By the City of New York	75 00		
By the City of New York	75 00		
		\$ 495 48	\$ 117 750 00
Amounts paid for		\$ 221 12	
Water supplied	\$ 221 12		
Water supplied	1 27 36		
Water supplied	124 00		
		\$ 372 48	\$ 90 750 00

Attest **WALTER H. HARDING,**
Registrar.

COMMITTEE, December 15th, 1898

Whereas we have audited the accounts of the Water Registrar and
 certify that they correspond in the amounts collected, abated, re-
 ceived and expended with the statement submitted by the City
 Auditor and approved by the City Auditor.

FRANK A. ALLEN, / *Committee*
STILLMAN F. KELLEY, / *on*
 \ *Accounts*

CITY OF CAMBRIDGE,
OFFICE OF THE CITY TREASURER,
December 1, 1898.

To the Cambridge Water Board:

Gentlemen:—I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1898.

Gross collections for account of "Water Works, Rates, fines, etc."	\$306,763.07
Abatement certificates received and paid on "Water Rates"	5,276.29
Gross collections for account of "Water Works, Supply Account" . .	6,654.33
Abatement certificates received and paid on "Supply Account" . . .	18.30
"Refund" certificates have been presented and paid to the amount of	3,163.74
Uncollected bills in my hands November 30, 1898, for account of	
"Maintenance, Construction and Water Rates," amount to	1,621.55
Uncollected bills in my hands November 30, 1898, for account of	
"Supplies, Repairs, etc.," amount to	1,270.24
Gross Collections for account of Water Works, "Construction, General, Account"	76.73
Gross collections for account of Water Works, "Construction, Hobbs Brook Account"	576.26
Gross collections for account of Water Works, "Construction, Payson Park Account"	41.00
Gross collections for account of Water Works, "Maintenance, General Account"	1,344.96

Very respectfully,

WILLIAM W. DALLINGER,

City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM,

City Auditor.

REPORT

OF THE

SUPERINTENDENT OF WATER WORKS.

Cambridge, December 1, 1898.

To the Honorable Water Board of the City of Cambridge.

IN OBEEDIENCE TO THE City Ordinance, Therewith,
presenting the thirty-fourth annual report of the Superintendent,
dated according November 30, 1898.

Consumption.

The total quantity of water pumped during the past year was	2,792,321,110 gallons.
Daily average water pumped during the past year was	7,650,195 gallons.
Quantity of water used for water supply	602,565,725 gallons.
Quantity of water used for sprinkling streets	81,000,800 gallons.
Quantity of water used for flushing sewers	1,250,000 gallons.
Quantity of water used for cleaning canals	7,500,000 gallons.
Quantity of water used for fire fighting purposes	12,666,000 gallons.

Total	727,882,525 gallons.
Quantity of water used for domestic purposes	2,064,448,585 gallons.

Number of gallons daily for each inhabitant on the total amount pumped, 85.69

Number of gallons daily for each inhabitant on the total amount used for domestic purposes, including water for private as well as for public buildings and fire purposes, 67.45

The increase in the consumption of water during the past

year must be accounted for largely by waste due to the increase of pressure throughout the City.

The amount of main pipe that has been renewed during the past four years, together with the supplies on the same, make it evident that in so far as the main pipe and street connections are concerned the works have never been in as good condition as at present.

I would recommend that the supplies for all public buildings be metered that we may be able to account as far as possible for the total consumption of water.

There have been installed during the past year four recording gauges, in the different parts of the City, to record the variation of the water pressure. One is located at No. 4 Engine House, North Cambridge; one at the City Hall; one at No. 3 Engine House, East Cambridge; and one at No. 7 Engine House, at the lower Port. The record sheet covers one week; all sheets are changed the same day and filed at the water office.

The grade of each gauge is taken and is recorded on the sheets as they are taken off, so that all the pressures can be referred to same datum line.

It may be of interest to know that during the recent large fire at the J. P. Squire establishment, in East Cambridge, the pressure at that point was fully up to the maximum pressure there before the increase made this year.

Comparative Statement of Total Pumping During the Past 9 Years.

Date.	Total Yearly Pumping.	Increase or decrease	Average Daily Pumping.	Increase or decrease.	Gallons to each inhabitant daily.
1890	1,638,550,512	112,111,507 incr'se	4,489,178	307,155, increase.	62.35
1891	1,778,056,775	139,506,263 "	4,871,388	382,210, "	64.71
1892	1,961,362,760	183,305,985 "	5,358,914	487,526, "	66.00
1893	2,234,863,924	273,501,164 "	6,122,915	764,001, "	74.50
1894	2,127,878,627	106,985,297 decr'se	5,829,804	293,111, decrease.	69.19
1895	2,190,781,892	62,903,265 incr'se	6,002,142	172,338, increase.	71.65
1896	2,413,506,557	222,724,665 "	6,594,280	592,138, "	75.90
1897	2,441,340,196	27,833,639 "	6,688,603	94,323, "	76.46
1898	2,792,321,110	350,080,914 "	7,650,195	961,592, "	85.69

Comparative Statement of Domestic Pumping During the Past 9 Years.

Year.	Domestic Supply Feet per day.	Increase or Decrease.	Average Daily Pumping	Increase or De- crease.	Gallons to each In- habitant daily.
1890	1,700,000	41,100,000	1,336,416	107,107	65.08
91	1,700,000	41,200,000	1,340,000	107,000	65.24
92	1,700,000	41,300,000	1,343,584	106,870	65.40
93	1,700,000	41,400,000	1,347,168	106,740	65.56
94	1,700,000	41,500,000	1,350,752	106,610	65.72
95	1,700,000	41,600,000	1,354,336	106,480	65.88
96	1,700,000	41,700,000	1,357,920	106,350	66.04
97	1,700,000	41,800,000	1,361,504	106,220	66.20
98	1,700,000	41,900,000	1,365,088	106,090	66.36
99	1,700,000	42,000,000	1,368,672	105,960	66.52

Water consumed in the	1,572,808
Water consumed in the	11,080
Water consumed per million gallons pumped	1,566.20
Lowest water in Fresh Pond was on May 2, 1898	17.45
Highest water in Fresh Pond was on Oct. 19, 1898	17.23
Average height of water in Fresh Pond	16.13
Highest water in Stony Brook reservoir was on Jan. 22, 1898	82.27
Lowest water in Stony Brook reservoir was on Aug. 1, 1898	73.42
Average water in Hobbs Brook reservoir was on Oct. 7, 1898	181.53
Lowest water in Fresh Pond Pumping Station	12.42
Highest water in Stony Brook reservoir	84.00

Total Rainfall for the Last Ten Years.

Month.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
December . . .	6.07	3.30	4.40	6.78	1.23	5.23	4.43	1.90	1.63	4.31
January . . .	6.64	2.94	6.08	4.32	1.87	3.05	3.57	2.40	3.32	4.75
February . . .	2.81	5.22	4.61	2.40	6.43	2.91	1.07	5.62	2.36	3.61
March . . .	3.29	7.02	5.74	3.56	2.50	.84	2.68	4.37	2.66	2.03
April . . .	3.73	4.83	2.72	.77	3.25	2.94	4.15	1.70	2.82	6.22
May . . .	5.65	6.09	2.44	6.00	7.30	4.63	2.39	2.42	4.24	3.92
June . . .	3.44	3.51	4.01	4.23	2.18	.81	2.76	2.33	5.16	1.82
July . . .	8.53	2.77	3.06	2.53	2.26	2.88	3.28	2.65	4.68	4.50
August . . .	3.78	3.48	3.68	6.11	5.95	1.63	4.71	2.45	5.06	7.34
September . . .	5.30	4.05	2.73	1.84	1.76	2.40	1.83	6.29	3.22	1.78
October . . .	3.73	9.31	5.10	2.15	3.77	5.19	10.16	3.10	.55	7.22
November . . .	6.51	1.28	3.08	4.04	1.99	3.34	6.09	3.53	6.83	4.92
Total . . .	60.08	53.80	48.25	44.85	40.49	35.85	47.12	38.82	42.53	52.42

Fresh Pond and Surroundings.

The roadway around the pond, the grass borders and the planted section have received the usual care.

The nursery has required more than ordinary care, as a large amount of transplanting has been necessary.

A large part of the standing grass has been sold, as the crop was much beyond the needs of the Department.

The water in the pond has been at the average height of 16.13 feet during the year and has been of remarkably good quality.

Work on the filling and grading of the section on the west side of the pond was begun on October 17th and continued until November 26th, when the weather made further work impracticable.

The buildings are in good condition but should be painted this year.

Fresh Pond Reservoir.

To credit From the Post Office		To credit From the Post Office		To credit From the Post Office	
Month	Year	Month	Year	Month	Year
December	1897	1897	1897	1897	1897
January	1898	1898	1898	1898	1898
February	1898	1898	1898	1898	1898
March	1898	1898	1898	1898	1898
April	1898	1898	1898	1898	1898
May	1898	1898	1898	1898	1898
June	1898	1898	1898	1898	1898
July	1898	1898	1898	1898	1898
August	1898	1898	1898	1898	1898
September	1898	1898	1898	1898	1898
October	1898	1898	1898	1898	1898
November	1898	1898	1898	1898	1898

Pumping Station and Grounds.

All the work in connection with the putting in of the new engine and boilers and the alterations of the buildings made necessary by the same, together with the alterations to the old engines, have been completed.

The Station is now in a very satisfactory condition.

The new engine has been in operation nearly the whole year and its performance has been very satisfactory. There has been no duty trial made as yet to determine the efficiency of the engine or boilers, but we hope to arrange for one early the coming year.

It will be necessary to do some work on the lawn and drive-ways the coming year.

Highland Street Reservoir.

On February 12th the water was shut off from this reservoir and the City supplied through the two sixteen-inch (16 in.) Ross reducing valves in the forty-inch (40-in.) main leading from Payson Park reservoir.

The pressure in the City was increased about fifteen pounds. This has continued to the present and the valves have given perfect satisfaction.

The water in Highland Street reservoir has since been drawn off and the basin cleaned out; it remains so at present.

I would recommend that the connections with this reservoir be cut off and the site disposed of for building purposes.

Payson Park Reservoir.

The whole City has been supplied from this source since February 12th.

The grounds about the reservoir have become a very popular resort for those driving or wheeling on account of the fine view from this point.

From September 19th to 24th the water was drawn off from the south basin for the purpose of cleaning and making an examination of the asphalt bottom. The asphalt was found to be blistered over an area of nearly one-third (1-3) of the bottom, the blisters in some cases being six feet, or more, in diameter.

I would recommend that the basin be underdrained the coming year.

A substantial tool house has been built on the north side of the reservoir.

Pipe Yard.

A considerable improvement has been made at the yard, this year, by the building of a new brick stable. The plans were prepared by Mr. C. Herbert McClure, architect, of Cambridge, and the contract was awarded to Mr. S. J. Keilly, of this City, for the sum of \$6,000.00. The stable has accommodations for sixteen horses, with wash room, harness room and other conveniences. The building is nearly completed and will be ready for occupancy the latter part of this month.

The working house has been separated from the shed and the end of the shed covered with corrugated iron as a protection against the weather. The upper tenement of the house has received some needed repairs and, when painted, will be in good appearance.

The lower tenement is in need of repairs which should be made during the coming year.

The stable will require some alterations to fit it for storage purposes. When these are completed the yard will be much improved and the Department will be benefited.

The material stored at the pipe yard a large amount of old material has been stored for years and with the probability, that some of it should have been disposed of years ago. It is recommended that such as, in the judgment of the Department, may be disposed of as old material.

Pipe Bridges.

The new bridge proposed by the Fitchburg Railroad Company on Massachusetts Avenue, will necessitate some consideration as to the water pipes at this point. It is felt that some way must be found to carry the pipes across the bridge, under the sidewalks, or finding for their support in the iron work supporting the roadway.

The sixteen-inch 16-in. pipe line across Back Lane Street bridge suffered serious damage during the recent storm, about three hundred twenty feet on the southerly side of the bridge

being carried into the river by the very high tide. The pipe has been raised and very little of it found damaged.

I would recommend that this pipe be removed, as there seems to be no need of it under the changed conditions of the water supply in this section.

Leakage.

Fourteen hundred eight (1,408) leaks have been reported and investigated.

Fifteen (15) have been stopped on iron main pipe, as follows: Five (5) on 4-inch, seven (7) on 6-inch, one (1) on 8-inch, one (1) on 12-inch and one (1) on 20-inch.

Twelve hundred seventy (1,270) have been reported on pipes and fixtures on premises; these have been repaired by the occupants or owners.

One hundred twenty-three (123) on supplies in streets have been repaired by the Department.

Of the total number of leaks stated above, twelve hundred sixty (1,260) were reported by the inspectors as the result of the annual canvas; they were distributed as follows: Three hundred fifty-one (351) on faucets, eight hundred thirty-five (835) on water closets and seventy-four (74) on pipes.

Table Showing a Gain or Loss in Total Consumption for the Year 1898 over the year 1897.

	Total Consumption 1898.	Total Consumption 1897.	Increase or Decrease x or —
December,	210,803,340	216,367,481	— 5,564,141
January,	235,138,540	222,050,830	x 13,087,710
February,	221,925,900	190,232,540	x 31,693,360
March,	228,800,475	202,428,145	x 26,372,330
April,	212,361,600	197,402,585	x 14,959,015
May,	215,073,060	191,350,040	x 23,723,020
June,	241,610,160	195,727,510	x 45,882,650
July,	250,865,560	215,121,905	x 35,743,655
August,	265,579,600	210,523,365	x 55,056,235
September,	229,313,020	208,745,405	x 20,568,515
October,	260,146,275	209,623,410	x 50,522,865
November,	220,702,680	181,766,980	x 38,935,700
Total . .	2,792,321,110	2,441,340,196	x 350,980,914

Main Pipe.

Main pipes have been laid in the following streets: 1,400½ feet of 8 inch in Aiston Street, from Pearl Street to Waverly Street; 1,000 feet of 4 inch removed, 714 feet of 6 inch in Amory Street, from Summer Street to Hampshire Street, in place of 4 inch removed; 100 feet of 6 inch in Antrim Street, from Cambridge Street north, in place of 4 inch removed; 136½ feet of 6 inch in Arcticon Place; 845 feet of 6 inch in Arlington Street, from Massachusetts Avenue to Walnut Avenue, in place of 4 inch removed; 105 feet of 6 inch in Bancroft Street, from Western Avenue; 415 feet of 6 inch in Beaver Street, from Cambridge Street to Flagg Street, in place of 4 inch removed; 42 feet of 6 inch in Binney Street, east and west from Center Street; 140 feet of 6 inch in Boardman Street, from Harvard Street to Broadway, in place of 4 inch removed; 826½ feet of 6 inch in Bow Street, from Massachusetts Avenue to Linden Street; 1,000 feet of 4 inch removed, 210 feet of 1½ inch in Boyle Street, from Mt. Auburn Street; 34 feet of 6 inch in Briggs Street; 515 feet of 6 inch in Brown Street, from Foster Street to Fifth Street, in place of 4 inch removed; 81 feet of 6 inch in Buena Vista Park; 662 feet of 6 inch in Centre Street, from Third Street to Hancock Street, in place of 4 inch removed; 100 feet of 6 inch in Clark Street, from School Street to Main Street, in place of 4 inch removed, and 1,397 feet of 6 inch from Washington Street to Webster Avenue, in place of 4 inch removed; 248 feet of 6 inch in Clement Circle, from State Street east; 600 feet of 6 inch in Cowpathwaite Street, from Parker Street to De Wolf Street, in place of 4 inch removed; 200 feet of 4 inch in Crossland Street, from Bristol Street to Clark Street, in place of 4 inch removed; 1,171 feet of 6 inch in De Wolf Street, from Flagg Street to Mt. Auburn Street, in place of 4 inch removed; 274 feet of 6 inch in Design Street, from Griggs Street to Western Avenue, in place of 4 inch and 1½ inch removed; 2,285 feet of 6 inch in Elm Street, from Cambridge Street to Harvard Street, in place of 4 inch and 1 inch removed; 107 feet of 6 inch in Elmwood Street; 2,144 feet of 6 inch in the Esplanade of the Park Department; 38 feet of 12 inch in Everett Street, from Massachusetts Avenue

east, in place of 12-inch removed; 1,358 feet of 6-inch in Fayette Street, from Broadway to Cambridge Street, in place of 4-inch removed; 162 feet of 6-inch in Felton Street, from Broadway north; 649 feet of 6-inch in Flagg Street, from De Wolf Street to Putnam Avenue, in place of 4-inch removed; 13 feet of 6-inch in Foster Street, from Lowell Street east; 791½ feet of 6-inch in Frost Street, from Harris Street to Roseland Street, in place of 4-inch removed; 22 feet of 6-inch in Garden Street, connecting Concord Avenue, and 10 feet of 6-inch connecting Mason Street; 413 feet of 6-inch in Gerry Street, from Mt. Auburn Street, in place of 3-inch removed, and 157½ feet of 6-inch, extension; 603 feet of 6-inch in Grant Street, from Banks Street to DeWolf Street, in place of 4-inch removed; 12 feet of 6-inch in Gray Street, from Martin Street; 495 feet of 6-inch in Hamilton Street, from Brookline Street to Pearl Street in place of 4-inch removed; 389 feet of 6-inch in Hancock Street, from Centre Street to Harvard Street, in place of 4-inch removed; 19 feet of 6-inch in Harris Street, from Frost Street; 71 feet of 6-inch in Harrison Street, from School Street north; 34 feet of 4-inch in Holly Street, from Brooks Street to Clark Street, in place of 1½-inch removed, and 183 feet of 4-inch, extension; 305 feet of 6-inch in Hudson Street, from Bowdoin Street to Hudson Place; 97 feet of 4-inch in Inman Place, from Jones' Alley west; 27 feet of 6-inch and 170 feet of 4-inch in Irving Terrace, from Sumner Street east; 20½ feet of 4-inch in Jones' Alley; 177½ feet of 4-inch in King Street, from Walden Street; 244 feet of 4-inch in Kirkland Road, from Kirkland Street; 194 feet of 6-inch in Lafayette Square, in place of 4-inch removed; 97½ feet of 2-inch in Lincoln Place; 578 feet of 6-inch in Lincoln Street, from Elm Street to Winsor Street, in place of 3-inch and 4-inch removed, and 204 feet of 6-inch from Webster Avenue to Willow Street; 471 feet of 6-inch in Lopez Street, from Brookline Street to Pearl Street, in place of 4-inch removed; 896 feet of 6-inch in Lowell Street, from Brattle Street to Mt. Auburn Street, in place of 4-inch removed; 27 feet of 6-inch in Madison Street, connecting Concord Avenue; 250 feet of 6-inch in Market Street, from Clark Street to Bristol Street (extension), and 932 feet of 6-inch from Elm Street to

100 feet in place of 4 inch and 4 inch removed, 542 feet
 Main Street, from Ayer Street to Bowdoin Street,
 1,249 feet of 20 inch in Massachusetts
 Street, from Everett Street to Holmes Place, in place of
 1,249 feet of 20 inch and 11 feet of 12 inch at Everett Street, 297
 feet in Oxford Street. Ward 5, from Roseland Street
 to Bowdoin Street, 1 foot of 4 inch in Oxford Street. Ward 24, from
 Bowdoin Street to 100 feet of 6 inch in Park Avenue, 255 feet of
 6 inch in Bowdoin Street from Main Street south, 163 feet of
 6 inch in Holmes Place extension, 118 feet of 6 inch in Pres-
 dent Street, 100 feet of 6 inch in Bowdoin Street north, 1,204 feet of 6 inch in
 Bowdoin Street, 78 feet of 6 inch in Rose-
 land Street, 100 feet of 6 inch in Oxford Street west, and 204 feet of 6 inch
 in Bowdoin Street in place of 4 inch removed, 11 feet of 6 inch
 in Spring Street, 214 feet of 6 inch in Watson Street, 214 feet of 6 inch in
 Spring Street, from Austin Street to Pine Street, in place of
 214 feet of 6 inch and 162 feet of 6 inch, from Clark Street to
 Bowdoin Street, in place of 4 inch removed, 214 feet of 6 inch
 in Bowdoin Street, from Cambridge Street to Gore Street, in place
 of 214 feet of 6 inch, 100 feet of 6 inch in Sheridan Street, from
 Bowdoin Street, 100 feet of 6 inch in Spring Street, from Third
 Street, 100 feet of 6 inch in Suffolk Street, from Common
 Street, 100 feet of 6 inch in place of 4 inch removed, 64 feet
 of 6 inch in Spring Street, from Cambridge Street to Kirkland
 Street, 100 feet of 6 inch removed, 180 feet of 6 inch in Union
 Street, 100 feet of 6 inch in Market Street, in place of
 100 feet of 6 inch, 100 feet of 4 inch in Vassar Street, from
 Bowdoin Street, 18 feet of 4 inch in Avenue Street, from
 Bowdoin Street to Avenue Street, in place of 4 inch re-
 moved, 100 feet of 6 inch in Vassar Street extension, 114
 feet of 6 inch in Ward Street, from Harvard Street, in place of
 100 feet of 6 inch, 100 feet of 6 inch in Watson Street, from
 Bowdoin Street to Pine Street, in place of 4 inch removed,
 100 feet of 6 inch in Ward Street, from Lincoln Street to
 Bowdoin Street, 118 feet of 6 inch, from Lincoln Street to Pal-
 mer Street, 100 feet of 6 inch in West Street, from Sherman
 Street to Ward Street, 100 feet of 6 inch in Worcester Street,
 from Bowdoin Street to Norfolk Street, in place of 4 inch re-

moved; 513 feet of 6-inch in York Street, from Berkshire Street to Webster Avenue.

Total length of cast iron pipes laid during the year is 36,135 feet, or 6.8437 miles; renewals, 4.81 miles; extensions, 2.0337 miles; the weight of the metal was 596.98 tons.

The sizes of cast iron pipe laid during the year, their lengths and weights, are as follows:—

Size.	Length in Feet.	Weight in Tons.
20 inches	1,249	108.17
12 inches	49	1.90
6 inches	32,982½	471.18
4 inches	1,854½	15.73

In the two locations in Binney Street the eight-inch (8-in.) pipe has been offset, and in Hampshire Street the six-inch (6-in.) pipe has been offset for the accommodation of the Cambridge Gas Light Company.

At Massachusetts Avenue, corner of Albany Street, the twelve-inch (12-in.) pipe has been offset that the Sewer Department might have the customary location for its pipe.

In Inman Street, at Austin Street, the old three-inch (3-in.) main pipe has been capped. The Telephone Company required the location occupied by this pipe, which was abandoned in 1872 when the new twelve-inch (12-in.) was laid.

The six-inch (6-in.) main in Aberdeen Avenue has been raised.

The two-inch (2-in.) main in New Street has been relocated.

Supplies.

Two hundred twenty-eight (228) new supplies have been laid during the year.

Thirteen thousand, seven hundred forty-one (13,741) supplies have been laid to date, November 30, 1898.

Five hundred seventy-six (576) supplies have been renewed; of these, thirty-three (33) were enlarged.

Two (2) supplies have been extended.

Sixty-one (61) supplies have been furnished with sidewalk shut-off boxes.

When laying the new and enlarged main pipes, the supply

pipes were renewed where necessary, and, where requested by the owners of the property, extended on the premises, the owners paying the expense of such extension.

In many cases, included above, the supply pipes have been changed, the owners of the property bearing the cost of the additional expense in the street and the total cost on the premises. The number of fifty-four (54) supplies were renewed under these conditions as follows: Five (5) in Allston Street, one (1) in Amory Street, nineteen (19) in Amory Street, twelve (12) in Arlington Street, two (2) in Banks Street, seven (7) in Beaver Street, two (2) in Boardman Street, five (5) in Bow Street, eight (8) in Brown Street, ten (10) in Centre Street, twenty-nine (29) in Clark Street, nineteen (19) in Cowperthwaite Street, eight (8) in Crossland Street, eleven (11) in DeWolf Street, eleven (11) in Dodge Street, forty-nine (49) in Elm Street, seven (7) in Fayette Street, nineteen (19) in Flag Street, two (2) in Frost Street, eleven (11) in Gerry Street, eighteen (18) in Grant Street, seventeen (17) in Hamilton Street, ten (10) in Hancock Street, two (2) in Holly Street, two (2) in Hudson Street, two (2) in Irving Terrace, two (2) in Levee Place, six (6) in Lincoln Street, twenty-three (23) in Lopez Street, six (6) in Lowell Street, one (1) in Lafayette Square, twenty-two (22) in Market Street, three (3) in Martin Street, six (6) in Massachusetts Avenue, two (2) in Rosland Street, two (2) in School Street, seven (7) in School Street, seventeen (17) in South Street, six (6) in Summer Street, fifteen (15) in Union Street, eight (8) in Village Street, twelve (12) in Watson Street, and eleven (11) in Worcester Street.

In Essex, Hampshire, Plymouth and Portland Streets, and Boston Avenue, the supplies have been offset for the Cambridge Gas Light Company, the cost of this work, as well as the expenses attending the changes in the main pipes in Binney and in Hampshire Streets, have been paid for by the company.

In order to not trespass on the locations of the sewer at North Main Street and in New Street, the supplies have been changed.

On the premises of Harvard College on Kirkland Street in Cambridge supplies have been offset.

The original supply for Gregory Heirs on Boylston Street has been removed.

Supplies for J. M. Woods, Bridge Street, have been shut off at the main and abandoned. Commercial Avenue is to be built on this site.

The four-inch (4-in.) fire supply for the New York Biscuit Company on Franklin Street has been connected to the main in street.

At the opening of the season the service boxes in all parts of the city were examined and lowered in places where they had been raised by the action of the frost.

Where the grades of the streets have been changed the service boxes have received attention, as follows: In Berkshire and Hardwick Streets they have been raised, and in Buena Vista Park, Eaton Street and Ellsworth Avenue, lowered.

Fountains.

One ice water drinking fountain of Jenks' make has been set at the corner of Massachusetts Avenue and Blake Street.

There are now four (4) in use.

One drinking fountain of Jenks' make has been set in Wyeth Square.

There are twenty-four (24) drinking fountains in use.

Total number of drinking fountains in use in the City, twenty-eight (28).

Supply for fountain in Fresh Pond Drive, near Holworthy Street gate house, has been renewed.

The drinking fountains located as follows have received necessary repairs. Broadway and Norfolk Streets, Cambridge and Third Streets, Central Square, Lechmere Square, Rindge Avenue, Winsor Street.

Street Watering Standpipes.

There has been no addition during the year to the number of street watering standpipes.

The standpipe at the corner of Sherman and Walden Streets has been reset; it is now located on Walden Street about sixty (60) feet from Sherman Street.

At the opening of the season the standpipes received their

Check Valves.

In the following streets the check valves have been removed: Arlington Street (6-inch), Bigelow Street (6-inch), Clinton Street (6-inch), Highland Avenue (6-inch), Lee Street (4-inch), Massachusetts Avenue at Pleasant Street (8-inch), and Massachusetts Avenue at Prospect Street, (10-inch).

The clapper of 4-inch check valve in Linden Street has been removed.

Meters.

There are four hundred forty-seven (447) meters set in the City.

Ball and Fitts	5
Buffalo	1
Crown	45
Desper	1
Empire	2
Frost	3
Gem	1
Hersey	92
Nash	9
Thomson	8
Trident	59
Union Duplex	1
Union Rotary	61
Worthington	158
Weir	1
	<hr/>
	447

The meters on the premises of John Quinn, Otis Street, and Chelmsford Foundry Company, on Portland Street, have been moved from the inside to the outside of the property.

Boston Woven Hose and Rubber Company has had its meter relocated (the 6-inch supply having been extended); and the meter at the Cambridge Electric Light Company's has been reset.

Hydrants.

Sixteen (16) hydrants have been added to the list this year.

Post hydrants have been set as follows: In Allston Street, corner of Brookline Street, Coffin; in Arlington Street, corner of Massachusetts Avenue, Coffin; in Appleton Street, corner of

Ashtab Avenue, Perkins; in Binney Street, corner of Fifth Street, Coffin; in Broadway, corner of Jordan Place, Coffin; in Eastman Street, corner of Broadway, Coffin; in Banks Street, corner of Grant Street, Coffin; in Centre Street, near Main Street, Coffin; in Comperthwaite Street, corner of Dewey Street, Coffin; in Clark Street, corner of Dickinson Street, Coffin; in Concord Avenue, near Buckingham Street, Perkins; in Foster Street, corner of Massachusetts Avenue, Chapman; in Forest Avenue, near Craigie Street, Holyoke; in Everett Street, near Massachusetts Avenue, Coffin; in Fayette Street, near North, Coffin; in First Street, near Roseland Street, Chapman; in Garden Street, at Walden Street, Coffin; in Glenwood Street, at Magazine Street, Coffin; in Grant Street, at De Wolf Street, Coffin; in Hamilton Street, at Brookline Street, Coffin; in Lowell Street, at Foster Street, Coffin; in Massachusetts Avenue, opposite Waterhouse Street, Coffin; in Massachusetts Avenue, at Jarvis Street, Coffin; in Mt. Auburn Street, at Sparks Street, Coffin; in Market Street, corner Elm Street, Coffin; in Market Street, corner Union Street, Coffin; in Portland Street, near Main Street, Coffin; in Rindge Avenue, west from Clifton Street, Coffin; in River Street, opposite Fairmont Street, Perkins; in Sumner Street, near Irving Terrace, Coffin; in Sumner Street, opposite Wood Street, Coffin; in Suffolk Street, near East, Coffin; in Willow Street, near Lincoln Street, Coffin; and in Worcester Street, near Columbia Street, Coffin.

Total number of post hydrants set, thirty-five (35), as follows: Twenty (20) Chapman, twenty-nine (29) Coffin, one (1) Holyoke and none (0) Perkins.

Flush hydrants have been set as follows: In Davis Street, corner of Broadway, and in Massachusetts Avenue, opposite Fairmont Street.

Total number of flush hydrants set, two (2).

Total number of hydrants (post and flush) set, thirty-seven (37).

Post hydrants have been removed, as follows: In Ash Street, and land taken by the City for park purposes, Chapman; in Buckingham Street, near Concord Avenue, Perkins; in Dunbar Street, corner of Massachusetts Avenue, Perkins; in Mt.

Auburn Street, near Sparks Street, Perkins; and in River Street, opposite Fairmont Street, Holyoke.

Total number of post hydrants removed, five (5), as follows: One (1) Chapman, one (1) Holyoke and three (3) Perkins.

Flush hydrants have been removed, as follows: In Brookline Street, corner of Allston Street; in Brookline Street, corner of Hamilton Street; in Broadway, corner of Boardman Street; in Banks Street, corner of Grant Street; in Centre Street, corner of Dana Street; in Concord Avenue, opposite Craigie Street; in Davis Street, corner of Broadway; in Frost Street, corner of Roseland Street; in Grant Street, corner of DeWolf Street; in Massachusetts Avenue, at Arlington Street; in Massachusetts Avenue, corner of Jarvis Street; in Massachusetts Avenue, opposite Tannery Street; in Market Street, corner of Elm Street; in Market Street, corner of Union Street; in Otter Street, corner of DeWolf Street; and in School Street, corner of Clark Street.

Total number of flush hydrants removed, sixteen (16).

Total number of hydrants (post and flush) removed, twenty-one (21).

Total number of hydrants in Cambridge, nine hundred twenty-two (922); of these, ten (10) Chapman in Potter Street and two (2) Chapman in Binney Street are the property of the American Rubber Company.

Below find styles and number.

Boston	158
Chapman	401
Coffin	40
Flush	143
Holyoke	88
Perkins	92

922

Two post hydrants have been broken by teams. One (Chapman) has required a new frost case, etc., only; and one (Perkins), at the corner of Mt. Auburn and Sparks Streets, has been replaced by a new Coffin.

Defective hydrants, as follows, have been repaired in their locations at corner of Cambridge and Eighth Streets, Cambridge

and Tremont Streets, Harvard and Bigelow Streets, Main and Portland Streets, Massachusetts Avenue and Frank Street, Massachusetts Avenue and Chester Street, Massachusetts Avenue and Lancaster Street, Elm Street, and Sparks Street.

The new kind of change of grade of streets or curbstones, the new water has been reset in Banks Street, in Cambridge Street at Huron Place, in Cambridge Street at Felton Street, in Tremont Street at Massachusetts Avenue, and Reservoir Street at Highland Street.

There have been laid and the wastes of the hydrants, following connected to the sewer: Hancock and Harvard Streets, Huron Street and Lancaster Streets, and Huron Avenue and Tremont Street.

Stony Brook

A new stone work points about the gate house and overflow have been pointed with Portland cement.

It will be necessary the coming year to build several hundred feet of stone fence near the upper end of the reservoir on the gate side to prevent cattle from getting to the basin.

Table showing the Daily Average Number of Gallons, by the Month, Flowing Over the Waste Way at Stony Brook.

	Gallons.	Number of Days.		Gallons.	Number of Days.
Jan. 1900	1,477,419	31	June 1900	88,000	30
Feb. 1900	1,364,722	28	July 1900	No overflow	
Mar. 1900	2,111,000	31	Aug. 1900	1,048,367	31
Apr. 1900	1,844,939	30	Sept. 1900	5,100	30
May 1900	2,061,327	31	Oct. 1900	649,774	31
May 1900	1,720,000	31	Nov. 1900	12,020,000	30

Total quantity wasted 12,041,000,000 gallons.

Total number of days in which water wasted 200.

Stony Brook Pipe Line

The pipe line has been examined as usual and all air valves are in the proper position as needed. The discharge from this main would be decreasing more rapidly than it should and as there are several depressions in the line where an accumulation could

take place, and in view of the fact that the screens in the gate house have been broken and a large amount of leaves, etc., carried into the pipe, I would recommend that an internal examination of this line be made this year by cutting in at different points with the A. P. Smith tapping machine and putting on manhole covers.

Hobbs Brook.

The land along the borders of the basin between Lexington Street and Winter Street dam has been graded and part of it seeded down.

The land along Winter Street has been partly graded and a low place near the new road has been filled.

Nineteen hundred (1,900) feet of fence extending from the Winter Street dam along Winter Street to the land of A. J. Merrill has been built.

* The overflow from the Winter Street dam has been carried to the brook below the dam.

A large amount of dead wood has been cut around the basin and the premises much improved.

I would recommend that the coming year, should the conditions be favorable, the meadows above the old ice house be ditched and the water courses cleaned out.

RECAPITULATION.

New Supplies.

[illegible]

Rain Pipe.

	10" 1/2	10" 1/2	10" 1/2	10" 1/2	10" 1/2	Total
Length in feet of iron pipe - extensions	-	-	5,111	461	971	6,543
Length in feet of iron pipe - renewals	1,001	82,116	161	-	-	83,278
Total length in feet of iron pipe	1,001	82,116	1,172	461	971	84,611
Number of joints	1	1	41	21	-	63
Number of bed-joints	-	-	-	-	-	0

Comparative Trenching for the Past 9 Years.

	Extensions	Renewals	Supplies	Total Feet	Miles
1899	11,712 1/2	1,979	15,525	29,216 1/2	5.52
1900	9,626 1/2	2,168	17,494	29,288 1/2	5.41
1901	14,764 1/2	11,929	16,011	42,704 1/2	8.19
1902	10,280 1/2	11,090 1/2	16,251 1/2	37,622 1/2	7.36
1903	11,473	17,641 1/2	17,211	46,325 1/2	8.16
1904	11,102	15,628 1/2	22,296	48,987 1/2	9.27
1905	17,621	36,261	17,201	71,083	11.55
1906	11,298	36,987 1/2	16,121 1/2	64,407	12.19
1907	11,045 1/2	21,297	12,146	44,488 1/2	8.21

Conclusion.

Following will be found the Engineer's report.

All of which is respectfully submitted.

E. C. BROOKS,

Superintendent.

REPORT

OF THE

PUMPING ENGINEER.

DECEMBER 1st, 1898.

To the Honorable the Water Board of the City of Cambridge:

Gentlemen:—From May 1st, the date of my appointment as chief engineer at the pumping station, the new twenty million gallon Leavitt pumping engine was run at intervals, as repairs on the pumping station would permit, until June 1st, when the engine was put to regular work and has run very satisfactorily to this date, with no trouble whatever.

Nos. 1 and 2 Worthington engines and No. 4 Blake engine are in first class condition, ready to run in one hour's notice if anything should happen to No. 7.

The new electric light plant was started May 12th, running daily since that date, doing all that was expected of it.

The steam pipe in the engine room for engines Nos. 1 and 2 has been covered with black walnut lagging; this completes all the new work in the main engine room.

The electric device for showing height of water at the reservoir has arrived at the station and will be put in operation soon.

Aside from piping up the pump and receiver, which I understand is ordered, and making a few changes on piping in the fire room for the testing engine and boilers, the plant is complete and in first-class condition.

Respectfully submitted,

E. I. HARRIS,
Engineer.

James Howard, Fred Lewis and Mitchell

[illegible]

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council:

The undersigned, Trustees of the Sinking Fund of the Water Works, herewith submit their annual report of the fund committed by law to their charge. The report covers the year ending November 30, 1898.

Dr.

Amount of the fund Nov. 30, 1897	\$464,138.28
Received during the year as follows:	
From the Treasurer of the City of Cambridge the annual required ap- propriation from the water rates .	103,656.00
From interest on investments . . .	10,153.53
	\$577,947.81

Cr.

Amount paid City Treasurer to meet maturing bonds	\$12,500.00
Amount paid for interest on invest- ments purchased	1,897.03
Amount paid for premium on invest- ments purchased	18,154.00
Less the amount of the "Contingent Loan Obligation" of the City of Cambridge heretofore reckoned in the assets, now not included as an interest bearing asset	200,000.00
Leaving the interest bearing amount of the fund November 30, 1898 .	345,396.78
	\$577,947.81

The following are the investments belonging to the funds.

First Mortgage Co., maturing Feb. 1, 1915	\$2,000.00
First Mortgage Co., maturing Oct. 1, 1916	65,000.00
First Mortgage Co., maturing Dec. 1, 1917	10,000.00
First Mortgage Co., maturing Nov. 1, 1920	5,000.00
	\$112,000.00
Equity Co., maturing July 1, 1919	\$11,000.00
Equity Co., maturing April 1, 1920	4,000.00
First Trust B. Co., maturing July 1, 1920	50,000.00
First Trust B. Co., maturing Oct. 1, 1920	5,000.00
First Trust B. Co., maturing Aug. 1, 1921	10,000.00
Southwestern Co., maturing July 1, 1919	8,000.00
Western Co., maturing March 1, 1917	2,000.00
Western Co., maturing April 1, 1917	24,000.00
Haystack M. Co., maturing Jan. 1, 1918	15,000.00
Western Co., maturing March 1, 1918	4,000.00
First Trust B. Co., maturing Aug. 1, 1920	25,000.00
Equity Co., maturing May 1, 1921	2,000.00
Equity Co., maturing May 1, 1921	1,000.00
Equity Co., maturing May 1, 1921	2,000.00
Equity Co., maturing May 1, 1921	2,000.00
Equity Co., maturing May 1, 1927	2,000.00
Amherst Co., maturing July 1, 1927	10,000.00
Equity Co., maturing May 1, 1928	2,000.00
Western Co., maturing June 1, 1928	6,000.00
Equity Co., maturing May 1, 1929	2,000.00
Equity Co., maturing May 1, 1930	2,000.00
Equity Co., maturing May 1, 1931	2,000.00
Equity Co., maturing May 1, 1932	2,000.00
Southwestern Co., maturing Aug. 1, 1933	2,000.00
Southwestern Co., maturing July 1, 1934	11,000.00
Equity Co., maturing Jan. 1, 1935	25,000.00
	252,000.00
	\$145,000.00
Equity Co., National Bank of Cambridge	200.78
	\$145,200.78
Equity Co., National Bank of Cambridge	\$200,000.00

The bonded water debt, which the foregoing fund is to pay, matures as follows, viz:—

November 1, 1906, three and one-half per cent	43,000.00
October 1, 1907, four per cent	90,000.00
November 1, 1907, four per cent	22,000.00
July 1, 1908, four per cent	46,000.00
August 1, 1908, four per cent	25,000.00
July 1, 1909, four per cent	20,000.00
May 1, 1910, four per cent	288,000.00
July 1, 1910, four per cent	75,000.00
September 1, 1910, four per cent	125,000.00
January 1, 1911, four per cent	20,000.00
October 1, 1911, four per cent	35,000.00
January 1, 1912, four per cent	150,000.00
May 2, 1912, four per cent	75,000.00
November 1, 1912, four per cent	45,000.00
February 1, 1913, four per cent	100,000.00
August 1, 1913, four per cent	50,000.00
April 1, 1915, four per cent	200,000.00
August 1, 1915, four per cent	200,000.00
April 1, 1916 four per cent	100,000.00
July 1, 1916, four per cent	200,000.00
August 1, 1916, four per cent	100,000.00
October 1, 1916, four per cent	265,100.00
April 1, 1917, three and one-half per cent	200,000.00
July 1, 1917, three and one-half per cent	100,000.00
November 1, 1917, three and one-half per cent	75,000.00
December 1, 1917, three and one-half per cent	40,000.00
December 1, 1917, three and one-half per cent	100,000.00
May 2, 1918, three and one-half per cent	50,000.00
June 1, 1918, three and one-half per cent	60,000.00
November 1, 1918, three and one-half per cent	50,000.00
April 1, 1924, four per cent	300,000.00
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	\$3,249,100.00

In making the foregoing report a word of reminder and explanation may be necessary. The City Council will remember that no appropriation was made in the annual budget for any interest on the "Contingent loan obligation" for \$200,000.00 which for fifteen years has been enumerated among the assets of the fund, and consequently no interest has been received by the Trustees in this obligation. While this obligation is still held among the possessions of the fund, we have felt that it was wise to refrain from enumerating it among the live assets held for the payment of the bonded water debt in view of the opinion of the City Solicitor given to the Mayor and City Council of our City, that "said obligation" is not a legal and valid obligation of the City.

We note with regret that for the first time in a number of years nothing has been received under the head of "surplus receipts."

We now respectfully call the attention of the City Council to the advisability of seeking an amendment to the Legislative Act of 1895 whereby these funds may be put into the charge of the Board of Commissioners of the Sinking Fund of the City instead of remaining in charge of an ex officio board, a majority of the members of which may be changed at any time.

ALVIN F. SORTWELL,

GEORGE F. SAUNDERS,

WILLIAM W. DALLINGER,

Trustees of the Sinking Fund of the Cambridge Water Works.





City of Cambridge

ANNUAL REPORT

March, 1914

Cambridge Water Board

PRINTED FOR THE DEPARTMENT

City of Cambridge

ANNUAL REPORT

OF

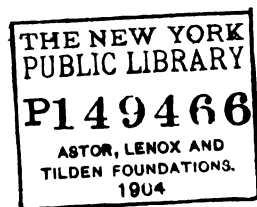
THE WATER BOARD

FOR THE

YEAR ENDING, NOVEMBER 3, 1890

PRINTED FOR THE DEPARTMENT

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BOSTON:
J. A. CUMMINGS PRINTING CO
1900

CAMBRIDGE WATER BOARD

1900

President.

WILLIAM B. DURANT

Members of the Board.

JOSEPH H. HOWARD	Term expires 1901
WILLIAM B. DURANT	Term expires 1901
JOSEPH W. KELLEY	Term expires 1902
JOHN NATHAN FILLMORE	Term expires 1903
JOHN N. STEVENS	Term expires 1904

WALTER H. HARDING, Clerk

Superintendent of Works.

EDWIN C. BROOKS

Water Registrar.

WALTER H. HARDING

Trustees of Sinking Fund of Water Loan.

**THE MAYOR, CITY TREASURER AND PRESIDENT OF THE
COMMON COUNCIL**

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1865-99.

CHESTER W. KINGSLEY	1865-1894	
JOHN SARGENT	1865-1871	
A. K. P. WELCH	1865-1871	
ROBERT DOUGLASS	1865-1871	
SAMUEL SLOCOMB	1865-1876	
Z. L. RAYMOND	1871	
HENRY L. EUSTIS	1871-1885	
J. WARREN MERRILL	1871-1881	
GEORGE P. CARTER	1871-1883	
JOHN H. LEIGHTON	1876-1879	
KNOWLTON S. CHAFFEE	1879-1889	
JAMES M. W. HALL	1881-1899	
LEANDER M. HANNUM	(1883-1884	
	(1885-1893	
JOHN F. O'BRIEN	1884-1895	
GEORGE H. HOWARD	1889-	(Now in Office.)
E. BURT PHILLIPS	1893-1896	
STILLMAN F. KELLEY	1894-	(Now in Office.)
FRANK A. ALLEN	1895-1899	
WELLINGTON FILLMORE	1896-	(Now in Office.)
EDMUND H. STEVENS	1899-	(Now in Office.)
WILLIAM B. DURANT	1899-	(Now in Office.)

Presidents of the Board.

J. WARREN MERRILL	1865-1867
EZRA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-

REPORT OF THE CAMBRIDGE WATER BOARD

Cambridge, December 14, 1899.

Presented to the City Council of the City of Cambridge.

The annual report of the Cambridge Water Board for the year ending November 30, 1899, is herewith submitted for your consideration.

The condition of the different water basins, and the amount and character of the water supply were so fully considered in the last annual report that it is unnecessary to say that no essential change has taken place during the year, the efforts of the Board having been mainly confined to the maintenance of the purity of the water and the maintenance of the supply system as then established. The year has been marked by a number of measures adopted to protect the purity of the water, and a number of new supplies that have been introduced.

The most important events of the year have been the adoption of the new State Board of Health, applicable to the Metropolitan and County of Water Supply, in order to carry into effect a statute of the Commonwealth, Chapter 40A, relative to the pollution of sources of water supply, and the adoption by the Council of the City of Cambridge, and by the State Board of Health, of new rules, regulations, and orders, the purpose of protecting the public health, and securing the purity of the water supply, and the adoption of measures for maintaining the purity of the water supply, and the adoption of measures for maintaining the purity of the water supply, and the adoption of measures for maintaining the purity of the water supply.

The Board of Health, in its report, has also drawn the public attention to the importance of the Water Board's proposals for the attention of the State Board of Health, and has also drawn the public attention to the importance of the Water Board's proposals for the attention of the State Board of Health.

The Water Board, with the consent of the Council, has also the honor to report that the State Board of Health, in its report, has also drawn the public attention to the importance of the Water Board's proposals for the attention of the State Board of Health, and has also drawn the public attention to the importance of the Water Board's proposals for the attention of the State Board of Health.

of Lincoln taking the ground that a prior right in the brook was held by Mr. Sargent, and that it was better for our city to purchase the place than to invoke its aid in a case where its power might be questioned. We are glad to be able to say that this menace no longer exists, and that the most dangerous place on our whole water system is now free from all possible pollution.

We desire to express our gratitude to the town authorities of Lincoln for refusing another license to the former owner, on account of the bad record of his former establishment for uncleanness, and for saving thereby our supply from the pollution which might come from another slaughter-house located near the brook. The local Boards of Health of Lincoln and Waltham have heartily co-operated with us in assisting to protect our Hobbs Brook system from pollution, and we are glad to express our appreciation of their successful efforts in that behalf.

We have also recently taken about eight acres of land belonging to Reuben Wyman, bordering on Hobbs Brook, immediately below and south of the Winter Street dam. This land was used for grazing and pasturage of cattle and swine, and necessarily would soon become a source of pollution. We trust that no more takings or purchases of land will be necessary, at least for a long time to come.

An important event of the year was the passage of an ordinance by the City Council prohibiting skating on Fresh Pond. Recent discoveries in bacteriology demonstrate fully the necessity of this action, and it is hoped that the people will appreciate the fact that the health of the great majority of the inhabitants is of far more importance than the amusement of the small minority who have heretofore been accustomed to skate upon the pond. Skating facilities can doubtless be provided elsewhere, as they are in other neighboring cities, where reservoirs of water used for drinking purposes are not used for skating. We are glad to be informed that the subject will receive the attention of the City Council, acting through the proper department.

FINANCIAL STATEMENT IN BRIEF.

The total cost of the Water Works to November 30, 1898, was	\$5,602,364 56
There was expended during the past year on Construction account	46,651 09
Making the total cost to November 30, 1899	<u>\$5,649,015 65</u>

WATER BOND ACCOUNT.

The whole amount of bonds outstanding is	\$3,272,100 00
From this is to be deducted the present value of the Water Debt Sinking Fund, including the note of the city for \$200,000 00	665,583 82
Net Water Debt, November 30, 1899	<u>\$2,606,516 18</u>

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WATER BASINS

the water in the storage reservoirs, and is not only to maintain the water at a temperature suitable for drinking but also to protect it from pollution. The water is usually well protected from pollution, but the amount of rain and snow during the winter months is so small that the water is often less than the average of previous years. With the minimum amount of rain and snow during the winter months, the water is often less than the average of previous years. Nevertheless, we must remember that other dry years have occurred and some provisions must be made to meet the needs of the population whose constant increase in population has increased the demand for water. The water is now being stored in the reservoirs of the Grand Canyon of the Colorado River. The present theory is that the water is being stored in the reservoirs of the Grand Canyon of the Colorado River. The present theory is that the water is being stored in the reservoirs of the Grand Canyon of the Colorado River.

1. The average life expectancy at birth in 1908 was 46.6-49.5 years. Since 1960, it has increased to 71. In 1970, the average life expectancy at birth was 73.6 years for males and 76.5 years for females. Since 1960, the life expectancy at birth has increased from 73.6 years for males to 76.5 years for females. This is due to the fact that the population is aging, and the life expectancy at birth is increasing. The life expectancy at birth is the average number of years a person is expected to live, based on the current mortality rates. The life expectancy at birth is a key indicator of the health and well-being of a population. The life expectancy at birth is a key indicator of the health and well-being of a population. The life expectancy at birth is a key indicator of the health and well-being of a population.

1. The first step in the process of the investigation was to determine the nature of the problem. This was done by interviewing the complainant and the person who was alleged to have committed the offense. The complainant stated that the person in question had been harassing her for some time. The person in question denied the allegations and stated that he had no contact with the complainant.

From that point the advance has been as follows :

In 1891	64.71 gallons.
In 1892	66 gallons.
In 1893	74.50 gallons.
In 1894	69.19 gallons.
In 1895	71.65 gallons.
In 1896	75.90 gallons.
In 1897	76.46 gallons.
In 1898	85.69 gallons.

These figures show clearly that some cause other than mere legitimate use of water is at work, and it cannot be doubted that the large increase in daily *per capita* consumption is due almost wholly to waste and leaks in pipes and water fixtures upon the premises of water takers. It is obvious that something must be done at once to stop this unnecessary waste, or a new pipe must be laid from Stony Brook to Fresh Pond. The cost of a new pipe at the present price of iron and labor would be between five hundred thousand and six hundred thousand dollars. For this sum bonds would have to be issued, under a new act of the Legislature, which should be applied for at once if it is to be needed, and the annual interest and sinking fund requirements would exceed thirty-five thousand dollars.

NEW CONDUIT OR A METER SYSTEM.

For some years the Water Board has advised the City Council that the increased consumption would before long require the laying of an additional conduit from Stony Brook. This year it became evident that such conduit must be laid, without delay, or else that the consumption must be reduced by controlling leaks and waste on the premises of the water takers. The Board, after careful investigation and consideration, extending over almost the entire fiscal year, finally concluded that the only reasonable course was the adoption of the meter system, which has been successfully and acceptably put into practice in Lowell, Worcester, Providence, Fall River, Pawtucket, Brockton, Taunton, Newton, Brookline, and many other cities, and so recommended to the City Council.

The daily average consumption *per capita* in these cities is about one-half of the consumption in Cambridge.

Our recommendation was based on the following reasons, viz. :

1. The Board did not feel warranted in incurring an expense of between five and six hundred thousand dollars in laying a new conduit from Stony Brook to Fresh Pond while, under a meter system, waste being checked, the present conduit would furnish sufficient water for ten,

...with the further probability that the
...sufficient to pay for
...of the

The first of these is the fact that the Commission has been unable to secure the necessary cooperation of the Government of the United States in the investigation of the activities of the Communist Party in the United States. The Commission has been unable to obtain the necessary information from the Government of the United States regarding the activities of the Communist Party in the United States. The Commission has been unable to obtain the necessary information from the Government of the United States regarding the activities of the Communist Party in the United States.

the 1990s, the number of people in the world who are undernourished has declined from 1.1 billion to 800 million. The number of people who are malnourished has declined from 1.5 billion to 1.1 billion. The number of people who are obese has increased from 100 million to 300 million. The number of people who are overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million.

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1. *Journal of the American Medical Association*, 1997; 277: 1033-1037.

the 1990s, the number of people in the world who are illiterate has increased from 1.2 billion to 1.5 billion. The number of illiterate people in the world is projected to reach 1.7 billion by the year 2015. The number of illiterate people in the world is projected to reach 1.7 billion by the year 2015. The number of illiterate people in the world is projected to reach 1.7 billion by the year 2015.

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appear excessive, but at present, with our expenditures exceeding our receipts, as in the past two years, we think an abatement of the charges should be made except for services actually rendered.

As to the charge for rent no other department is obliged to pay such charges. Moreover, we were obliged to vacate the apartment formerly used by us as a shop, and yet no reduction has been made in the amount of the rent charges, although as a result of our vacating the shop in City Hall we were compelled to erect a shop at the Auburn Street yard of the Water Works.

RECEIPTS.

As last year, our expenditures have exceeded our receipts, the deficit this year being \$240.27.

During the past year the Board has been deprived, by resignation from office, of the valued services not only of its President for many years, Hon. J. M. W. Hall, but also of Hon. Frank A. Allen, one of its most active and esteemed members. Both of these gentlemen had previously served the City with credit and distinction in the office of Mayor.

It is impossible to sufficiently acknowledge the long, faithful and intelligent service rendered the City by Mr. Hall. Elected a member of the Board in 1881, he served the City for eighteen years, the last five years as President of the Board.

The citizens of Cambridge can have but a slight knowledge of the inestimable value of Mr. Hall's devotion to the duties of his office. Especially during the inception and construction of the Hobbs Brook basin, as president of the Board he was called upon to give hour after hour, day after day, to the service of the city, to the temporary neglect of his private business interests. His devotion to duty as represented by the city's interests was something almost unparalleled, and has seldom been equalled.

He retires from the Board with the utmost respect and esteem of his fellow members, and with their heartiest best wishes that his success in business life may be as marked as was his administration of the affairs of the Water Board.

Mr. Allen is a splendid example of typical American citizenship. A successful business man, without any ambition for public life, but consenting to serve the city only because of the conviction that the best interests of the city demanded the sacrifice of his time and inclination. That he should have given five years of his time in the very busiest and most trying period in the construction of the water works, speaks volumes

WATER BOARD.

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and his long and varied experience in business rendered him an excellent and able associate, and his mature and sound judgment entitled him to a seat on the Board.

Respectfully submitted,

WILLIAM B. DURANT,	
GEORGE F. H. HOWARD,	<i>Cambridge</i>
STILLMAN F. KELLEY,	<i>Worcester</i>
WELLINGTON F. FLEMING,	<i>Boston</i>
EDMUND H. STEVENS,	

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 5, 1899.

To the Cambridge Water Board:—

GENTLEMEN:—In compliance with the requirements of the City Ordinance, I present the thirty-fifth annual report of the operations of this department showing the receipts, expenditures and abatements, together with a statement of the number of water takers, etc., for the year ending November 30, 1899.

Amount of bills remaining unpaid, November 30, 1898:—

Water rates	\$154 85
Meter rates	1,176 42
Supplies and repairs	1,270 24
Off and on	124 00
Seals	10 75
Maintenance account	79 15
Construction account	76 38

Amount of bills placed in hands of City Treasurer for collection from November 30, 1898 to November 30, 1899:—

Water rates	\$222,746 88
Meter rates	86,627 90
Supplies and repairs	6,464 11
Off and on	824 00
Fines	20 00
Rents	243 00
Seals	148 75
Maintenance account	2,426 97
Construction account	1,360 00
Total bills	\$323,753 40

There has been collected:—

Water rates	\$218,305 23
Meter rates	87,054 92
Supplies and repairs	6,592 26
Off and on	779 00
Fines	20 00
Rents	243 00
Seals	155 75
Maintenance account	1,830 09
Construction account	1,360 00

WATER REGISTER

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There has been added

Water rates, off and on and on sale	\$4,978 30
Supplies and repairs	194 77

There has been also added

Water rates	\$277 35
Water rates	167 40
Supplies and repairs	943 32
Off and on	118 00
Supplies	2 00
Maintenance account	674 00
Maintenance account	76 30
	<hr/> \$323,783 40

EXPENDITURES

Construction account general	\$33,561 00
Construction account Fresh Pond Land	115 00
Construction account Fresh Pond Materials	997 72
Construction account H. W. B. Pond Materials	11,874 17
Maintenance account general	61,630 41
Supplies account	6,316 06
	<hr/> \$114,607 36

ADJUSTMENTS

Water rates paid to the amount of	\$4,978 30
Supplies and repairs paid to the amount of	194 77
	<hr/> \$5,173 07

RECEIPTS

Water rates to be amount of	\$2,791 15
Water amounts deducted from the receipts	303 20 15
Amount for receipts for water	\$2,487 95 00
Off and on, from rates, on sale and Maintenance account	5,077 96
From the receipts of rates, from, etc.	<hr/> \$203,206 06

OFF AND ON

Water has been shut off for non-payment of rates, or per order on account of a leak, and on sale have been applied to fixtures by request of owners, as follows:

Water shut off in 1900	704
Supplies on sale, shut off in 1900	636
Supplies on sale, shut off in previous years	91
Two supplies on sale	300
One supply applied to fixtures in 1900	205
One supply returned, put on in 1900	130
One supply returned, put on in previous years	100

Statement of the yearly revenue received from water rates since the purchase of the works by the city :

From April 28, 1865, to December 1, 1865	\$32,367 19
From December 1, 1865, to December 1, 1866	40,073 27
From December 1, 1866, to December 1, 1867	52,733 62
From December 1, 1867, to December 1, 1868	63,747 42
From December 1, 1868, to December 1, 1869	76,149 30
From December 1, 1869, to December 1, 1870	92,603 95
From December 1, 1870, to December 1, 1871	111,782 65
From December 1, 1871, to December 1, 1872	127,201 30
From December 1, 1872, to December 1, 1873	146,117 32
From December 1, 1873, to December 1, 1874	153,634 27
From December 1, 1874, to December 1, 1875	138,880 37
From December 1, 1875, to December 1, 1876	179,166 76
From December 1, 1876, to December 1, 1877	154,843 59
From December 1, 1877, to December 1, 1878	157,443 91
From December 1, 1878, to December 1, 1879	164,681 90
From December 1, 1879, to December 1, 1880	173,325 49
From December 1, 1880, to December 1, 1881	170,062 73
From December 1, 1881, to December 1, 1882	177,430 80
From December 1, 1882, to December 1, 1883	179,361 89
From December 1, 1883, to December 1, 1884	161,526 27
From December 1, 1884, to December 1, 1885	185,544 36
From December 1, 1885, to December 1, 1886	199,404 43
From December 1, 1886, to December 1, 1887	204,748 64
From December 1, 1887, to December 1, 1888	211,156 27
From December 1, 1888, to December 1, 1889	221,124 70
From December 1, 1889, to December 1, 1890	231,116 32
From December 1, 1890, to December 1, 1891	227,054 53
From December 1, 1891, to December 1, 1892	237,527 08
From December 1, 1892, to December 1, 1893	242,219 78
From December 1, 1893, to December 1, 1894	250,032 71
From December 1, 1894, to December 1, 1895	268,813 62
From December 1, 1895, to December 1, 1896	281,030 00
From December 1, 1896, to December 1, 1897	291,457 62
From December 1, 1897, to December 1, 1898	297,129 78
From December 1, 1898, to December 1, 1899	302,569 00

RECEIPTS.

The receipts for water as given in the above statement show a gain of \$5,400 as compared with the collections for 1898. The normal gain is about \$10,000 per annum, the stagnation in building operations being partially the cause of the loss, and the setting of meters during the year and consequent collection of but five-twelfths of the annual rates is responsible for the remainder of the loss.

All the annual water rate charges have been paid, the only charges remaining unpaid being for additional fixtures (\$277.55) and for metered water (\$142.60), in all, \$420.15 out of a total of \$310,000.

METERS.

Following the Board decided to set meters to cover domestic consumption at the option of the owners. About one hundred fifty persons availed themselves of the opportunity, the meters applied for being almost entirely for three or more families almost exclusively, the owners of the city having reason to believe a saving could be effected from such a plan. The results show a loss in revenue of about eleven per cent compared with the collection at schedule rates.

Last spring the Board ordered about one hundred sixty meters set in the most populous sections of the city. The revenue received from these meters for five months indicates an annual increase of twenty-eight and one-half per cent as compared with the former charges at schedule rates.

It seems to be a fair conclusion that the city would meet with no loss of revenue as the result of setting meters, and, unquestionably, the present excessive waste of water would be discontinued after the installation of meters.

COMPARATIVE STATEMENT.

	1898		1899	
CONSTRUCTION ACCOUNT (HOBBS BROOK RESERVOIR).				
<i>Received.</i>				
From bonds issued.....	\$187,000 00		\$13,500 00	
From premium on bonds sold....	5,055 00			
From sale of grass, feed, old material, etc.....	576 26	\$192,631 26	65 00	\$13,565 00
<i>Expended.</i>				
Construction of reservoir, land settlement, etc.....	\$182,619 92		\$11,874 17	
Balance of appropriation.....	10,011 34	\$192,631 26	1,690 83	\$13,565 00
CONSTRUCTION ACCOUNT (FRESH POND LAND).				
<i>Received.</i>				
From bonds issued.....	\$63,000 00		\$500 00	
From premium on bonds sold....	3,486 00	\$66,486 00		\$500 00
<i>Expended.</i>				
Settlement for lands taken, etc...	\$62,288 57		\$415 00	
Balance of appropriation.....	4,197 43	\$66,486 00	85 00	\$500 00
CONSTRUCTION ACCOUNT (FRESH POND RESERVOIR).				
<i>Received.</i>				
From bonds issued.....		\$8,000 00		\$1,000 00
<i>Expended.</i>				
For work at Fresh Pond.....	\$5,734 83		\$967 92	
Balance of appropriation.....	2,265 17	\$8,000 00	2 08	\$1,000 00
CONSTRUCTION ACCOUNT (GENERAL).				
<i>Received.</i>				
From bonds issued.....	\$30,000 00		\$33,500 00	
From premium on bonds.....	1,098 00			
From sale of pipe, fittings, etc....	76 73	\$31,174 73	1,295 00	\$34,795 00
<i>Expended.</i>				
Sundry bills and pay rolls.....	\$26,007 47		\$33,364 00	
Balance of appropriation.....	5,167 26	\$31,174 73	1,431 00	\$34,795 00
SUPPLY ACCOUNT.				
<i>Received.</i>				
From pipe and labor on supplies.		\$6,036 03		\$6,592 26
<i>Expended.</i>				
Sundry bills for stock and labor..		\$5,064 46		6,346 06
Excess of receipts.....		\$971 57		\$246 20
MAINTENANCE ACCOUNT.				
<i>Received.</i>				
From "rates, fines, etc.".....	\$298,336 54		\$303,766 75	
From sale of grass, old material, etc.....	1,331 46		1,830 09	
Accrued interest on water bonds sold.....	455 97	\$300,123 97		\$305,596 84
<i>Expended.</i>				
Care and repairs.....	\$76,111 76		\$61,690 81	
Interest on water debt.....	124,854 00		130,674 00	
Sinking fund requirement.....	108,656 00	\$304,621 76	113,718 50	\$306,083 31
Deficit in receipts.....		\$4,497 79		\$486 47

COMPARATIVE STATEMENT *Continued*

1898	Expenditure account, excess of expenditures over receipts, excess of receipts	\$4,377 79	
	Excess of total expenditures over total receipts		\$4,377 79
1899	Expenditure account, excess of expenditures over receipts, excess of receipts	\$4,377 79	
	Excess of total expenditures over total receipts		\$4,377 79

The excess of expenditures as shown in the statement for 1898, amounting to \$4,377.79, has been paid to the City Treasurer from the balance of the water works on Construction account, and the amount advanced to said Construction account when there are sufficient surplus receipts.

The excess of expenditures as shown in the statement for 1899, amounting to \$4,377.79, has been advanced from the city treasury, and advanced to said Construction account when the surplus receipts will warrant it. These accounts covering the transactions of the past two years, stand as follows:

Advanced from Construction account	\$4,377 79
Advanced from funds of the city	1073 37
To be paid from surplus receipts when opportunity offers	\$4,377 79

Water is supplied to the manufactories, business blocks, houses, etc., through meters, water is supplied to 19,845 families, 841 stables, 1,111 houses and 1,111 shops, 1,111 stores and offices, by the following fixtures, viz:

22 1/2" faucets	40 urinals
1 1/2" wash basins	14 yard hydrants
1 1/2" wash tubs	4 fountains
1 1/2" bath tubs	26 lumber washers
22" cup cisterns	2 1/2" hand hose
1 1/2" pump cisterns	13 meters
1 1/2" pump cisterns	

Also:

- 945 fire hydrants - mostly 1 1/2" on private premises
- 6 fire reservoirs
- 20 drinking fountains in public squares
- 10 street watering machines
- 6 public sanitation

The above schedule of fixtures does not include those in school-houses, engine houses, police stations, and other city buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made with excellent results.

Respectfully submitted,

WALTER H. HARDING,

Registrar.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1899.

Water rates repaid November 30, 1899	\$1,531 27
Supplies and repairs repaid November 30, 1899	1,270 24
Refund on water repaid November 30, 1899	124 00
Over payment November 30, 1899	10 00
Balance due amount repaid November 30, 1899	79 15
Amount due amount repaid November 30, 1899	76 34
	<u>\$2,991 79</u>

By the City Treasurer
for the month of December 1, 1899,
1899

Water rates from various ledgers	\$213,016 50
Water rates from fractional ledger	9,750 50
Water rates from meter ledger	46,627 00
Refund on water	676 00
Over	20 00
Under	247 00
Over	144 75
Supplies and repairs	1,604 21
Water rates	2,425 07
Over payment	1,500 00
	<u>\$325,641 43</u>

\$325,641 43

Water rates	\$213,016 50
Water rates	9,750 50
Water rates	46,627 00
Refund on water	676 00
Over	20 00
Under	247 00
Over	144 75
Supplies and repairs	1,604 21
Water rates	2,425 07
Over payment	1,500 00
Supplies and repairs	6,572 25
	<u>\$316,560 23</u>

By the City Treasurer

Water rates of and on and under	\$1,531 27
Supplies and repairs	124 00
	<u>\$1,655 27</u>

There remains uncollected :—

Water rates	\$420 15	
Supplies and repairs	943 32	
Off and on	118 00	
Seals	2 00	
Maintenance account	676 03	
Construction account	76 38	
	<hr/>	2,235 88
Total bills for collection		\$323,753 40
Less abated	\$5,177 27	
Less refunded	2,791 15	
Less unpaid	2,235 83	
	<hr/>	10,204 30
Net receipts		<u>\$313,549 10</u>

Attest :

WALTER H. HARDING,

Registrar.

CAMBRIDGE, December 14, 1899.

I have examined the accounts of the Water Registrar and find that they correspond in the amounts collected, abated, refunded and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor.

STILLMAN F. KELLEY,

Committee on Accounts.

STATEMENT OF THE CITY TREASURER.

23

CITY OF CAMBRIDGE,
 OFFICE OF CITY TREASURER,
 December 1, 1899.

WILLIAM H. H. H. H.

I give you herewith a record of the transactions of the City of Cambridge during the year ending November 30, 1899.

Amount for account of Water Works - Rates, fines, etc.	\$311,336 60
Amount received and paid on - Water Rates	6,979 30
Amount for account of Water Works - Supply Account	6,791 08
Amount received and paid on - Supply Account	194 77
Amount for account of Water Works - Construction, Maintenance, etc.	2,791 15
Amount received and paid on - Construction, Maintenance, etc.	1,792 36
Amount for account of Water Works - Construction, Maintenance, etc.	943 32
Amount received and paid on - Construction, Maintenance, etc.	1,793 00
Amount for account of Water Works - Construction, Maintenance, etc.	65 00
Amount received and paid on - Construction, Maintenance, etc.	1,430 00

Very respectfully,

WM. W. DALLINGER,

City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM,

City Auditor.

REPORT OF THE SUPERINTENDENT OF WATER WORKS

CAMBRIDGE, December 1, 1899.

To the Honorable Water Board of the City of Cambridge:

GENTLEMEN:—Complying with the City Ordinance, I herewith submit the twenty-fifth annual report of the Superintendent, for the year ending November 30, 1899.

CONSUMPTION.

Total quantity of water pumped during the past year	2,882,570,430 gallons
Daily average water pumped during the past year	7,897,453 "
Quantity of water sold by meter	644,920,500 "
Quantity of water used for sprinkling streets	107,901,125 "
Quantity of water used for flushing sewers	1,250,000 "
Quantity of water used for cleaning sanitaries	7,500,000 "
Quantity of water used for drinking fountains	35,000,000 "
Total	796,571,625 "
Leaving for domestic purposes	2,085,998,805 "

Number of gallons daily for each inhabitant on the total amount pumped, 87.16.

Number of gallons daily for each inhabitant on the total amount used for domestic purposes, including water for private stables, hose, public buildings and fire purposes, 63.08.

COMPARATIVE STATEMENT OF TOTAL PUMPING DURING THE PAST TEN YEARS.

Date.	Total Yearly Pumping.	Increase or Decrease.	Average Daily Pumping.	Increase or Decrease.	Gallons to each Inhabitant daily.
1890.....	1,638,750,512	112,111,507 increase.	4,489,179	307,155 increase.	62.35
1891.....	1,778,056,778	139,306,261 "	4,870,388	382,209 "	64.71
1892.....	1,961,362,760	183,305,987 "	5,338,915	487,527 "	66
1893.....	2,234,863,924	273,501,164 "	6,122,915	784,000 "	74.50
1894.....	2,127,878,627	106,985,297 decrease.	5,829,804	293,111 decrease.	69.19
1895.....	2,190,781,892	62,903,265 increase.	6,002,142	172,338 increase.	71.65
1896.....	2,413,506,557	222,724,665 "	6,594,280	592,138 "	75.90
1897.....	2,441,340,196	27,833,639 "	6,688,603	94,323 "	76.46
1898.....	2,792,321,110	350,980,914 "	7,650,115	961,592 "	85.69
1899.....	2,882,570,430	90,249,320 "	7,897,453	247,258 "	87.16

CONTENTS OF WATER WORKS.

29

THE "WOMEN" OF THE MIDDLE CLASS DURING THE LAST
TEN YEARS

[illegible]

1. The first of the four "Black Hawk Reservoirs" was on January 27, 1914.	100.00
2. The second of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
3. The third of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
4. The fourth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
5. The fifth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
6. The sixth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
7. The seventh of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
8. The eighth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
9. The ninth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
10. The tenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
11. The eleventh of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
12. The twelfth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
13. The thirteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
14. The fourteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
15. The fifteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
16. The sixteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
17. The seventeenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
18. The eighteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
19. The nineteenth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
20. The twentieth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
21. The twenty-first of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
22. The twenty-second of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
23. The twenty-third of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
24. The twenty-fourth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
25. The twenty-fifth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
26. The twenty-sixth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
27. The twenty-seventh of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
28. The twenty-eighth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
29. The twenty-ninth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
30. The thirtieth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
31. The thirty-first of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
32. The thirty-second of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
33. The thirty-third of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
34. The thirty-fourth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
35. The thirty-fifth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
36. The thirty-sixth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
37. The thirty-seventh of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
38. The thirty-eighth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
39. The thirty-ninth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
40. The fortieth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
41. The forty-first of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
42. The forty-second of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
43. The forty-third of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
44. The forty-fourth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
45. The forty-fifth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
46. The forty-sixth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
47. The forty-seventh of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
48. The forty-eighth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
49. The forty-ninth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00
50. The fiftieth of the four "Black Hawk Reservoirs" was on February 1, 1914.	100.00

... ..

[illegible]

FRESH POND AND SURROUNDINGS.

The work around the pond has consisted of the usual care of the roadways, walks, planted sections and grass plots, together with the care of the nursery.

About eight hundred dollars (\$800.00) worth of stock has been sold from the nursery this year, owing to our having no appropriation for using the same on graded sections.

The riprapping around the pond, which was displaced by the ice last winter, has been replaced, and the fence repaired where needed.

The height of the pond has been at an average of 15.31 feet, and the water has been of its usual good quality.

The low water during the past fall has given opportunity for cleaning out a large amount of weed-growth in the shallow portions of the pond.

The buildings are in good condition, and will need very slight repairs the coming year.

FRESH POND RESERVOIR.

DATE.	Lowest elevation during month.	Highest elevation during month.	Monthly Rain-fall, inches.	INTAKE GATE.			
				8-inch Opening.		30-inch Opening.	
				Opened.		Opened.	Closed.
1898.							
Dec. 4.....	16.28	.....	2	During entire month.	28 turns.	During entire month, 30 ins.	
Dec. 27.....	16.72	.....				
1899.							
Jan. 25.....	16.14	.....	3.85	During entire month.	From 1st to 26th, 28 turns.		January 25th.
Jan. 27.....	17.15	.....			From 26th to 31st, 1 1/4 turns.		
Feb. 26.....	15.84	.....	3.99	During entire month.	From 1st to 20th, 15 1/2 turns.		
Feb. 2.....	16.88	.....			From 20th to 28th, 28 turns.		
Mar. 1.....	15.85	.....	5.94	During entire month.	From 1st to 26th, 28 turns.		
Mar. 27.....	17.02	.....			From 26th to 31st, 9 1/4 turns.		
Apr. 3).....	16.31	.....	1.32	During entire month.	From 1st to 26th, 9 1/4 turns.		
Apr. 3.....	16.94	.....			From 26th to 30th, 28 turns.		
May 30.....	16.12	.....	.77	During entire month.	28 turns.	From 2d to 17th, 15 inches	
May 6.....	16.47	.....				From 17th to 31st, 30 inches.	
June 30.....	15.07	.....	3.17	During entire month.	28 turns.	During entire month, 30 ins.	
June 1.....	16.16	.....				During entire month, 30 ins.	
July 30.....	13.86	.....	3.12	During entire month.	28 turns.	During entire month, 30 ins.	
July 1.....	15.9	.....				During entire month, 30 ins.	
Aug. 30.....	13.43	.....	3.21	During entire month.	28 turns.	During entire month, 30 ins.	
Aug. 2.....	13.98	.....				During entire month, 30 ins.	
Sept. 19.....	13.17	.....	4.63	During entire month.	28 turns.	During entire month, 30 ins.	
Sept. 2.....	13.61	.....				During entire month, 30 ins.	
Oct. 6.....	13.36	.....	3.08	During entire month.	28 turns.	During entire month, 30 ins.	
Oct. 30.....	13.64	.....			Closed for ten hours, Oct. 31st	During entire month, 30 ins.	For ten hours, October 31st.
Nov. 2.....	13.65	.....	2.20	During entire month.	28 turns.	During entire month, 30 ins.	
Nov. 29.....	14.24	.....				
Total.....			37.28				

PUMPING STATION AND GROUNDS

The grounds around the Pumping Station have received the usual amount of grading necessary to put them in satisfactory condition.

The new engine and boilers have been in operation throughout the season and have worked very satisfactorily.

A test run of the engine and boilers was made during June last, under the supervision of Professor Ira N. Hollis, of the Lawrence Scientific School, who gave a rate of 128,817,000 ft. lbs. per one hundred pounds of New River coal, dry. The engine is doing better than this in comparison with others.

The new engine has been built for the Chief Engineer of the Pumping Station on the land belonging to the Water Works, situated east of North Main Avenue, near the corner of Worthington Street.

HIGHLAND STREET RESERVOIR

The reservoir remains in the same condition as last year, nothing being done except the cutting of grass on the banks and the care of the sluiceway.

PAYSON PARK RESERVOIR

The grounds about the reservoir have received the necessary care, and the tanks have been scraped and painted.

The level of the water has been maintained at an average of about 100 feet above the bed of the river, and the leakage, as shown by the wear on the bottom of the sluiceway, is small.

PIPE YARD

Following the removal of the shop from the City Hall, a new pipe shop, convenient in for several years, has been effected. The plans were prepared by Mr. C. Herbert M. Clark, architect, of Portland, for a two-story brick shop, to be located on the site of the old engine house. The contract was awarded to Messrs. E. W. Benton & Co.

The structure was well adapted to the work and received.

The tanks have been removed from the old shop and set up, as has the new engine and vertical boiler, in the new shop.

The new engine and boiler in the new shop has been connected with the shafting and is now ready to haul at any time from the Cambridge Electric Light Company's cables when the boiler is not in use.

The motor testing room in the station has been fitted with tank, valves and other necessary fixtures for the testing of all kinds of motors.

The dwelling house has been shingled and other repairs made, putting the whole in good condition.

PIPE BRIDGES.

The sixteen-inch (16) pipe across Brookline Bridge, which was damaged by the high tide last year, has been removed and stored at the pipe yard.

The building of the new bridge over the Fitchburg Railroad on Massachusetts Avenue has been delayed so that the twelve-inch (12) connection across the same has not been put in, but will be, in all probability, during the coming winter.

HIGH SERVICE.

No extension has been made on the high service system during the year.

Sixteen streets have been taken off, as the present pressure is sufficient to amply supply the elevations of the locations removed.

Following will be found a list of the streets that are at date supplied by the high service, November 30, 1899.

Agassiz Street.	Hillside Avenue.
Appleton Street, from Brattle Street to beyond Hutchinson Street.	Holly Avenue.
Arlington Street.	Humboldt Street.
Avon Hill Street.	Huron Avenue, from Appleton Street to Raymond Street.
Bates Street.	Lancaster Street.
Bellevue Avenue.	Linnaean Street.
Bellevue Avenue, west.	Mason Street.
Brattle Street, from Appleton Street to Mason Street.	Massachusetts Avenue, from Garden Street to Quincy Street.
Brewster Street.	Massachusetts Avenue, from near Trowbridge Street to Dana Street.
Buena Vista Park.	Mt. Pleasant Street.
Centre Street.	Mt. Vernon Street.
Chatham Street.	Quincy Street, from Harvard Street to Broadway.
Cleveland Street.	Raymond Street, from Linnaean Street to Walden Street.
Dana Street, from Massachusetts Avenue to Broadway.	Reservoir Street, from Highland Street.
Dunster Street, from Massachusetts Avenue to Mt. Auburn Street.	Riedesel Avenue.
Ellery Street, from Massachusetts Avenue to Broadway.	Spark Street, from Huron Avenue to Brattle Street.
Garden Street, from Huron Avenue to Linnaean Street.	Upland Road, from Richdale Avenue to Huron Avenue.
Garden Street, from Mason Street to Massachusetts Avenue.	Vassal Lane, from Huron Avenue.
Harvard Street, from Quincy Street to Dana Street.	Vincent Street.
Harvard College Campus.	Walnut Street.
Highland Street.	Ware Street.
	Washington Avenue.

LIST OF CHECK VALVES IN USE.

1. Check Valve at H. F. Lincoln Street
 2. Check Valve at Massachusetts Avenue
 3. Check Valve at College Ground
 4. Check Valve at Lincoln Street
 5. Check Valve at Massachusetts Avenue
 6. Check Valve at Wallen Street

LEAKAGE.

The number of twenty four hundred sixty two (2,462) leaks reported this year.

It is worthy of note that this number is the largest annual amount ever reported, it exceeding the account of last year (1908) by ten thousand six hundred and thirty four (10,634).

This increase is the result of a special and very careful inspection made during the season for the detection of leaks, in order to diminish the amount of loss of water, which had become seriously increased by our increasing pressure.

Wherever defects in mains or supplies in streets, these leaks have been reported to the department, and on the premises the occupants or owners have made the necessary repairs.

The leaks were discovered as follows:

Two in three inch main

Three in four inch main

Four in six inch main

One in eight inch main

Two in twenty four inch main

One in meters

Three in hydrants

One hundred twenty three on supplies in streets

Four hundred thirty eight on fountains

Seventeen hundred forty six on water closets

Twenty four on stop and waste valves

One hundred twenty on pipes, valves, and joints

Total, 2,462

A number of leaks was caused in laying Pleasant and River Streets while the work of laying the new gas mains for the Massachusetts Pipe and Gas Company was being carried on. The cost of the necessary repairs was paid by the Company.

SUPERINTENDENT OF WATER WORKS.

TABLE SHOWING A GAIN OR LOSS IN TOTAL CONSUMPTION FOR THE YEAR 1899 OVER THE YEAR 1898.

	Total Consump- tion, 1899.	Total Consump- tion, 1898.	Increase or De- crease, + or -.
December	250,320,840	210,803,340	+ 39,517,500
January	265,448,480	235,138,540	+ 30,309,940
February	269,707,680	221,925,900	+ 47,781,780
March	233,806,320	228,800,475	+ 5,005,845
April	211,254,880	212,361,600	- 1,006,720
May	239,712,880	215,073,060	+ 24,639,820
June	259,134,040	241,610,160	+ 17,523,880
July	278,324,300	250,865,590	+ 27,458,710
August	242,280,380	265,579,600	- 23,299,220
September	228,769,400	229,313,920	- 544,520
October	210,751,380	260,146,275	- 49,394,895
November	194,960,040	220,702,680	- 25,742,640
Total	2,682,570,430	2,792,321,110	+ 80,249,330

MAIN PIPE.

Main pipes have been laid in the following streets: 281 feet of 6-inch in Belmont Street (extension); 185 feet of 6-inch in Bent Street, from First Street; 132 feet of 6-inch in Bird Street, from Belmont Street; 142 feet of 1½-inch in Blair Place, from Bolton Street; 344 feet of 6-inch in Bolton Street, for the Street Department, and 521 feet of 6-inch from Sherman Street; 358 feet of 6-inch in Camelia Avenue, from Cambridge Street; 140 feet of 6-inch in Chatham Street, from Dana Street; 114 feet of 1½-inch in DeWolf Place; 1102 feet of 6-inch in the Esplanade; 191 feet of 6-inch in Fairview Avenue; 1463 feet of 6-inch in Franklin Street, from Magazine Street to Sidney Street, in place of 4-inch removed; 506 feet of 6-inch in Garden Street, from Concord Avenue to Waterhouse Street, and 351 feet of 6-inch from Waterhouse Street to Mason Street in place of 6-inch removed; 182 feet of 6-inch in Hardwick Street, from Berkshire Street; 214 feet of 6-inch in Herbert Street, from Richdale Avenue to Cambridge Terrace; 543 feet of 4-inch in Jordan Place, from Broadway; 392 feet of 6-inch in Lawn Court, from May Street; 428 feet of 6-inch in Magazine Street, from Glenwood Street, and 460 feet of 1½-inch at Captain's Island; 377 feet of 8-inch in Massachusetts Avenue, from Albany Street to Vassar Street; 975 feet of 6-inch, from Chauncy Street to Sacramento Street, in place of 6-inch removed; 2439 feet of 12 inch, from Inman Street to Putnam Avenue, in place of 8-inch removed; 129 feet of 10-inch from Putnam Square to beyond Trowbridge Street, in place of 10-inch removed; 793 feet of 6-inch from Sacramento Street to Linnaean Street, in place of 6-in removed, and 737 feet of 6-inch from Waterhouse Street to Chauncy Street, in place of 6-inch removed;

[illegible][illegible]

the 1990s, the number of people in the world who are illiterate has increased from 1.2 billion to 1.5 billion. The number of illiterate people in the world is expected to reach 1.7 billion by the year 2015. The number of illiterate people in the world is expected to reach 1.7 billion by the year 2015.

	Length of Run		Weight of Fish
.....	1 mile	6 lb.
.....	" "	7 " "
.....	" "	8 " "
.....	" "	9 " "
.....	" "	10 " "
.....	" "	11 " "
.....	" "	12 " "
.....	" "	13 " "
.....	" "	14 " "
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[illegible][illegible]

In Springfield Street, at Cambridge Street, the 6-inch pipe has been relocated and renewed, and in Auburn, Fairmont and Rockwell Streets the main pipes have been offset for the accommodation of this Gas Company, it paying all cost of material furnished and labor performed.

The water has been shut off from the 6-inch main in Willis Court.

The Metropolitan Park Commission has taken the land on the south side of Mt. Auburn Street bordering on Charles River, including this Willis Court, which eventually will be discontinued.

An air-valve has been set in the 20-inch main pipe in Broadway, at Prospect Street.

SUPPLIES.

Total number of supplies at date, November 30, 1899, fourteen thousand forty-nine (14,049).

There have been three hundred eight (308) additional supplies laid during the year.

One hundred fifty (150) old supplies have been furnished with sidewalk cocks and service boxes.

One hundred forty-nine (149) service boxes have been set on the small supplies, where the Water Board has placed meters during the year.

Three hundred thirty-two (332) old supplies have been renewed.

As the work on renewal of mains in the streets was being done, the supplies following were renewed at the expense of the Water Board in the streets; any work on the premises was charged to the owners of the property.

In Fairview Avenue	1	In Oxford Avenue	1
In Franklin Street	29	In Pacific Street	3
In Garden Street	3	In Pearl Street	44
In Jordan Place	3	In Pilgrim Street	7
In Massachusetts Avenue, from		In Portland Street	8
Inman Street to Putnam Ave.	31	In Prospect Street	53
In Massachuseets Avenue, from		In Sidney Street	6
Linnaean Street to Waterhouse		In Waterhouse Street	2
Street	18		

Total number of supplies renewed on this work, two hundred eight (208).

The number of supplies renewed on usual maintenance work was one hundred thirty-two (132); of these eighteen were enlarged.

Anticipating the future condition of Pearl, Prospect and Portland Streets, which have been paved and the surface of which is not to be disturbed, all the supplies have been located, ninety-six (96) renewed and twenty (20) new one-inch supplies laid to the vacant lots.

In Pearl Street forty-four (44) have been renewed and three (3) new

supplies on Portland Street eight (8) new supplies have been laid; and on Market Street fifty-two (52) have been renewed and nine (9) new ones laid.

There have also been included in the number of new and renewed supplies on Market Street.

On Market Street and River Street, the supplies have been offset and the valves have been interfered with the location of the pipes laid by the Metropolitan Electric Light Company, the expense was paid for by the City.

On Market Street and 1st Avenue, the old supplies have been connected with the new ones.

The New York and Long Island Telegraph Company has repaired the water pipes and laid off flattening supplies for the accommodation of the telegraph wires, at its expense.

A new rate of water supply service taxes has been made in accordance with the rates that have been lowered or raised to grade as the City.

DRINKING FOUNTAINS

There are now eight (8) drinking fountains in use in the City, and one (1) new water drinking fountain (Jenkins' make).

On the corner of 1st Avenue and water drinking fountain, the locations are as follows:

1. On the corner of 1st Avenue and Cambridge and
2. On the corner of 1st Avenue and 1st Street, near a Drain Street on the corner of 1st Avenue and 1st Street, east of the new Registry of Deeds Building.

The fountain on 1st Avenue is a fountain that is pulled up from the spring, and the Metropolitan Electric Light Co. has the fountain was pulled up from the spring, and the Metropolitan Electric Light Co. has the fountain having the fountain pulled up from the spring.

There are water drinking fountains on the corner of 1st Avenue and 1st Street, and the fountain is a fountain that is pulled up from the spring, and the Metropolitan Electric Light Co. has the fountain having the fountain pulled up from the spring.

The fountain on 1st Avenue, 1st Street, Market Street and Porter's Square and on 1st Avenue and 1st Street have two drinking fountains.

STREET WATERING STANDPIPES

There are now in addition to the street watering standpipes watering standpipes.

The standpipes on 1st Avenue, 1st Street, Market Street, and Porter's Square and on 1st Avenue and 1st Street have two drinking fountains.

GATES.

Forty-seven gates have been set in connection with extensions and renewals as follows :

Three (3) 4-inch ; thirty-three (33) 6-inch ; three (3) 8-inch ; two (2) 10-inch ; and six (6) 12-inch.

Six (6) gates have been set on supplies ; four (4) 4-inch ; one (1) 6-inch ; and one (1) 8-inch.

In Walden Street, corner of Mt. Pleasant Street, the 6-inch gate has been removed, and a new 6-inch set in its location.

One 6-inch gate has been set on the hydrant branch at the corner of Sidney Street and Massachusetts Avenue.

One 6-inch gate has been set in Irving and Casson's on Otis Street.

One 4-inch gate has been set in Madison Street, corner of Concord Avenue, in place of old one broken.

All the gates in the city have been inspected and their locations marked.

BOXES.

Thirty-nine (39) gate boxes have been set in place of old ones removed ; sixteen (16) wooden, two (2) hydrant, and twenty-one (21) iron.

Nineteen (19) boxes have been set on the work of extension and renewal ; thirteen (13) wooden and six (6) iron.

Eighty (80) boxes have been placed on meters set during the year ; forty (40) wooden and forty (40) iron.

Total number of boxes set, one hundred thirty-eight (138).

During the year the Street Department has found it necessary to change the grades in many of the streets, and at its request, the gate boxes have been raised or lowered as occasion required.

The expense of this work was, as usual, cared for by this department.

METERS.

The total number now in use is six hundred nineteen (619).

Ball & Flitts	4	Nash	13
Buffalo	1	Thomson	9
Crown	44	Trident	177
Empire	2	Union Duplex	1
Frost	2	Union Rotary	46
Gem	1	Worthington	147
Hersey	172		

The largest annual number of meters set, *i.e.*, one hundred seventy-two (172), has been added to the list this year.

[illegible]

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• **What is the purpose of the study?** The purpose of the study is to determine the effect of the use of a mobile phone on the performance of a simulated driving task.

[illegible]

(old flush removed from Cambridge, corner of Springfield Street); in Saint Paul Street, at angle, Perkins set; in Third Street, near Potter Street, Chapman set; in Winsor Street, near Cambridge Street, Chapman set; in Winter Street, at Fourth Street, Chapman set (Perkins removed); in Woodbridge Street, near Massachusetts Avenue, Chapman set; on premises of Middlesex County, House of Correction, two (2) Chapman set.

Three flush hydrants have been set in new locations, i. e., two on the Park Esplanade near Harvard Bridge, and one on Magazine Street at Leverett Street; these are to be used by the Park Department.

One flush hydrant has been set in place of old flush removed at the corner of Reed and Harvey Streets.

There have been set in new locations nineteen Chapman hydrants, one Coffin hydrant, one Holyoke hydrant, one Perkins hydrant, and three flush hydrants.

The following have been set in place of hydrants removed; ten Chapman in place of flush, two in place of Boston, one in place of Coffin, one in place of Holyoke, and one in place of Perkins; one Coffin in place of Boston, and one in place of Coffin; one flush in place of flush.

One Chapman hydrant has been removed.

In the following locations the hydrants have been repaired; Chilton Street, River Street opposite Fairmont Street, and Bridge Street at East Street.

For the accommodation of the Street Department the hydrants have been relocated at Huron Avenue, corner of Concord Avenue; in Norris Street; in Kirkland Street, near Oxford Street, and in Richdale Avenue.

In Willis Court the Chapman hydrant has been removed; this court is to be closed.

In Richdale Avenue two Chapman hydrants have been relocated, the laying out of Herbert Street necessitating this change.

The total number and kinds of hydrants in use in the City are as follows:

Boston	162
Chapman	428
Coffin	42
Flush	132
Holyoke	86
Perkins	95
Total	945

STONY BROOK

A contract for 25,000 feet of wire fencing has been built near the head of the basin, to keep the cattle from the brook.

The drainage from the Washburn and Colburn Places has been cared for by the construction of cesspools.

Similar arrangements were made with the owners of the new home of the West was in Weston, to dispose of the drainage so as to not pollute the water supply.

The Sargeant Place station put in by the City, has been thoroughly cleaned out, and all rubbish about the place have been burned. The new wire fence, considerable fencing about this place the coming year.

TABLE NO. 10. THE DAILY AVERAGE NUMBER OF GALLONS, BY THE SEWER, FLOWING OVER THE WASTE WAY AT STONY BROOK.

	Gallons	Number of Days		Gallons	Number of Days
January 1900	1,125,000	31	June 1900	1,000,000	30
February 1900	950,000	28	July 1900	1,000,000	31
March 1900	750,000	31	August 1900	1,000,000	31
April 1900	1,000,000	30	September 1900	1,000,000	30
May 1900	1,000,000	31	October 1900	1,000,000	31
June 1900	1,000,000	30	November 1900	1,000,000	30

Total for 1900 10,000,000 gallons.

Total for 1900 175.

STONY BROOK PIPE LINE

The work of laying the sewer in constant use the past year has been the same as of the examination reported in our last report.

The manholes, gates and flumes have been used the same as before.

Some of the gates have been changed to suit the character of the ground.

The work of laying the sewer in constant use the past year has been the same as of the examination reported in our last report.

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The length of the past season has been of such duration as to make the season of 1900-1901 the longest in several years.

The water supply was obtained from Winter Street Dam June 1, 1900. Since that date the supply for the city has been from this source.

There is a small, dark, irregularly shaped object, possibly a piece of wood or metal, lying on the ground near the base of the tree.

The *Journal of the American Veterinary Medical Association* has received the same number of letters as the *Journal of the American College of Veterinary Surgeons* having two hundred.

The water level was raised from the middle to the basin, and as the water level was raised to the basin, the water level was raised to the basin.

7. That the property at 100 Water Street, District No. 1, has been
used for the purpose of storing and other obstructing, and that portion
of the same which is a public street has been, and is, to be used

It is not clear whether the above results are due to the fact that the sample is not representative of the general population, or whether they are due to the fact that the sample is not representative of the general population of the United States. The results are consistent with the hypothesis that the sample is not representative of the general population of the United States.

1. *What is the purpose of the study?*

7. The Commission has been informed that the Government of the Republic of the Philippines has agreed to accept the findings and recommendations of the Commission.

EDUCATION

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[illegible]

W 6 2 1 1 0

	1977 Jan 1	1978 Jan 1	1979 Jan 1	1980 Jan 1	1981 Jan 1	1982 Jan 1	1983 Jan 1	1984 Jan 1	Y-40
1. Total number of cases	10	14	0	0	1	1	1	1	11
2. Total number of deaths	1	1	0	0	0	0	0	0	1
3. Total number of cases by age group									
0-14	1	1	0	0	0	0	0	0	1
15-24	1	1	0	0	0	0	0	0	1
25-34	1	1	0	0	0	0	0	0	1
35-44	1	1	0	0	0	0	0	0	1
45-54	1	1	0	0	0	0	0	0	1
55-64	1	1	0	0	0	0	0	0	1
65-74	1	1	0	0	0	0	0	0	1
75-84	1	1	0	0	0	0	0	0	1
85-94	1	1	0	0	0	0	0	0	1
95-104	1	1	0	0	0	0	0	0	1
105-114	1	1	0	0	0	0	0	0	1
115-124	1	1	0	0	0	0	0	0	1
125-134	1	1	0	0	0	0	0	0	1
135-144	1	1	0	0	0	0	0	0	1
145-154	1	1	0	0	0	0	0	0	1
155-164	1	1	0	0	0	0	0	0	1
165-174	1	1	0	0	0	0	0	0	1
175-184	1	1	0	0	0	0	0	0	1
185-194	1	1	0	0	0	0	0	0	1
195-204	1	1	0	0	0	0	0	0	1
205-214	1	1	0	0	0	0	0	0	1
215-224	1	1	0	0	0	0	0	0	1
225-234	1	1	0	0	0	0	0	0	1
235-244	1	1	0	0	0	0	0	0	1
245-254	1	1	0	0	0	0	0	0	1
255-264	1	1	0	0	0	0	0	0	1
265-274	1	1	0	0	0	0	0	0	1
275-284	1	1	0	0	0	0	0	0	1
285-294	1	1	0	0	0	0	0	0	1
295-304	1	1	0	0	0	0	0	0	1
305-314	1	1	0	0	0	0	0	0	1
315-324	1	1	0	0	0	0	0	0	1
325-334	1	1	0	0	0	0	0	0	1
335-344	1	1	0	0	0	0	0	0	1
345-354	1	1	0	0	0	0	0	0	1
355-364	1	1	0	0	0	0	0	0	1
365-374	1	1	0	0	0	0	0	0	1
375-384	1	1	0	0	0	0	0	0	1
385-394	1	1	0	0	0	0	0	0	1
395-404	1	1	0	0	0	0	0	0	1
405-414	1	1	0	0	0	0	0	0	1
415-424	1	1	0	0	0	0	0	0	1
425-434	1	1	0	0	0	0	0	0	1
435-444	1	1	0	0	0	0	0	0	1

COMPARATIVE TRENCHING FOR THE PAST TEN YEARS.

	Extensions.	Renewals.	Supplies.	Total feet.	Miles.
1890.....	11,713½	1,929	15,525	29,167½	5.52
1891.....	9,858½	2,958	17,864	30,680½	5.81
1892.....	16,784½	13,628	16,013	46,425½	8.79
1893.....	18,380½	11,008	14,233½	43,622	8.26
1894.....	13,672	17,481½	17,211	48,365½	9.16
1895.....	11,083	15,638½	22,266	48,987½	9.27
1896.....	17,621	26,043	17,361	61,025	11.55
1897.....	11,268	36,867½	16,121½	64,357	12.19
1898.....	11,045½	25,397	12,186	48,628½	9.21
1899.....	11,051½	9,427½	13,486½	33,965½	6.43

Following will be found the report of the Chief Engineer of the Pumping Station.

All of which is respectfully submitted,

E. C. BROOKS,
Superintendent.

REPORT OF THE PUMPING ENGINEER

December 1, 1899.

To the Honorable the Water Board of the City of Cambridge.

SIR:—The machinery at the Pumping Station is in first-class condition. No. 1 Worthington engine was run sixty-four hours and minutes, No. 2 Worthington sixty-six hours and forty minutes, and No. 3 Leavitt twenty-two hours and thirty minutes, during October, as they have been operated up to during the year. The Leavitt engine has never pumped the water used in the city the past year, and still continues to be a valuable asset to the expense.

Work has been done in skimming No. 1 and 2 boilers with magnesia and in painting the outside of the steam piping and iron work in the fire room.

A new water level gauge for showing the height of water in the new tank was started, December 1, 1898, working very satisfactorily to date.

Respectfully submitted,

E. L. HARRIS,

Pumping Engineer

ENGINE RECORD, POND LEVELS AND RAINFALL.

DATE.	Low Service Engines.						High Service Engine.				Engine No. 7.		Total Water Pumped.	Daily Average Water Pumped.	Total Coal Consumed.	Daily Average Coal Consumed.	Average Height of Pond.	Rainfall.
	Engine No. 1.			Engine No. 2.			Running Time.	Water Pumped.	Running Time.	Water Pumped.								
	Running Time.	Water Pumped.	Gallons.	Hrs.	Min.	Gallons.					Hrs.	Min.							Gallons.
1898. December..	—	—	—	—	—	—	294	45	250,330,840	8,562,854	350,450	11,305	16.79	3.85				
1899. January.....	—	—	—	—	—	—	314	10	269,707,680	9,031,417	359,400	12,896	16.30	3.99				
February.....	—	—	—	—	—	—	375	—	293,806,320	7,542,189	316,777	10,219	16.49	5.94				
March.....	—	—	—	—	—	—	275	—	211,354,880	7,045,163	495,200	9,840	16.65	1.32				
April.....	—	—	—	—	—	—	945	30	211,354,880	7,045,163	495,200	9,840	16.65	1.32				
May.....	—	—	—	—	—	—	275	05	239,712,880	7,732,673	315,600	10,181	16.33	7.77				
June.....	—	—	—	—	—	—	299	21	259,134,040	8,037,801	341,610	11,387	15.55	3.17				
July.....	—	—	—	—	—	—	321	55	278,324,200	8,678,200	350,000	11,290	14.47	3.19				
August.....	—	—	—	—	—	—	277	40	242,280,400	7,815,493	319,500	10,307	13.69	3.21				
September..	—	—	—	—	—	—	260	40	236,769,400	7,558,980	313,100	10,437	13.43	4.63				
October....	64	30	17,486,400	66	40	17,497,800	22	30	1,494,630	6,798,432	349,550	11,276	13.49	3.08				
November..	—	—	—	—	—	—	233	05	194,960,040	6,498,668	293,550	9,783	13.35	2.20				
Total	64	30	17,486,400	66	40	17,497,800	22	30	1,494,630	2,882,570,430	3,951,437	—	—	37.28				
Daily Av'ge	—	—	—	—	—	—	9	—	7,797,311	7,897,453	10,826	—	15.31	—				

REPORT OF THE TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS

Presented to the City Council

By the Honorable Trustees of the Sinking Fund of the Water Works,
in accordance with the annual report of the fund committed by law to
them. The report covers the year ending November 30, 1899.

DEBTS

Amount of the Fund, November 30, 1899 \$345,000.00

Expenses during the year, as follows:

Amount of Treasurer of the City of Cambridge, the
annual required appropriation from the water
works

113,719.50

From interest on investments

14,177.00

\$127,896.50

INCOME

Amount paid for interest on investments purchased

\$145.00

Amount paid for purchase of investments purchased

7,221.15

Amount of the fund, November 30, 1899

\$345,000.00

\$127,266.65

EDGAR R. CHAMPEIN,

WILLIAM F. BROOKS,

WM. W. DALLINGER,

*Trustees of the
Sinking Fund of
the Cambridge
Water Works*

The following are the investments belonging to the fund:

Cambridge	60	Maturing	Feb. 1, 1913	\$2,000.00	
"	60	"	Oct. 1, 1914	60,000.00	
"	100	"	Dec. 1, 1917	60,000.00	
"	100	"	Nov. 1, 1919	20,000.00	
"	60	"	Nov. 1, 1920	2,000.00	
					\$122,000.00
Massachusetts	60	"	Apr. 1, 1910	\$1,000.00	
Providence R. I.	20	"	July 1, 1910	5,000.00	
Ill.	60	"	May 1, 1910	5,000.00	
Washington	60	"	Aug. 1, 1910	10,000.00	

TRUSTEES OF SINKING FUND.

New Bedford	3 1-2s, maturing	Feb. 1, 1909	\$16,000 00	
Methuen	4s, "	Aug. 1, 1909	15,000 00	
Somerville	4s, "	July 1, 1910	8,000 00	
Wellesley	4s, "	Mar. 1, 1917	2,000 00	
Waltham	4s, "	Apr. 1, 1917	24,000 00	
Hallowell, Me.	4s, "	Jan. 1, 1918	15,000 00	
Wellesley	4s, "	Mar. 1, 1918	1,000 00	
Penobscot Shore Line } R. R. Co. }	4s, "	Aug. 1, 1920	25,000 00	
Quincy	4s, "	May 1, 1923	2,000 00	
"	4s, "	May 1, 1924	1,000 00	
"	4s, "	May 1, 1925	2,000 00	
"	4s, "	May 1, 1926	3,000 00	
"	4s, "	May 1, 1927	3,000 00	
Attleborough	4s, "	July 1, 1927	10,000 00	
Quincy	4s, "	May 1, 1928	3,000 00	
Winchester	4s, "	June 1, 1928	6,000 00	
Quincy	4s, "	May 1, 1929	3,000 00	
Fall River	3 1-2s, "	Nov. 1, 1929	75,000 00	
Quincy	4s, "	May 1, 1930	3,000 00	
"	4s, "	May 1, 1931	3,000 00	
"	4s, "	May 1, 1932	1,000 00	
Newton	4s, "	Aug. 1, 1935	2,000 00	
"	4s, "	July 1, 1936	11,000 00	
Grafton	3 1-2s, "	July 1, 1937	1,000 00	
Old Colony R. R. Co.	4s, "	Jan. 1, 1938	25,000 00	
Grafton	3 1-2s, "	July 1, 1938	2,000 00	
"	3 1-2s, "	July 1, 1939	2,000 00	
				\$333,000 00
				\$465,100 00
Cash in Bank				483 82
				\$465,583 82

The Bonded Water Debt, which the foregoing fund is to pay, matures as follows:—

Nov. 1, 1906,	3 1-2s	\$43,000 00
Oct. 1, 1907,	4s	90,000 00
Nov. 1, 1907,	4s	22,000 00
July 1, 1908,	4s	46,000 00
Aug. 1, 1908,	4s	25,000 00
July 1, 1909,	4s	20,000 00
May 1, 1910,	4s	288,000 00
July 1, 1910,	4s	75,000 00
Sept. 1, 1910,	4s	125,000 00
Jan. 1, 1911,	4s	20,000 00
Oct. 1, 1911,	4s	35,000 00
Jan. 1, 1912,	4s	150,000 00
May 2, 1912,	4s	75,000 00
Nov. 1, 1912,	4s	45,000 00
Feb. 1, 1913,	4s	100,000 00
Aug. 1, 1913,	4s	50,000 00
Apr. 1, 1915,	4s	200,000 00
Aug. 1, 1915,	4s	200,000 00

TRUSTED OF SINKING FUND.

45

Aug	1874	60	\$100,000
Dec	1874	60	100,000
Aug	1875	60	100,000
Oct	1875	60	250,000
Aug	1876	11 3/4	300,000
Dec	1876	31 1/2	100,000
Aug	1877	11 3/4	75,000
Dec	1877	11 3/4	100,000
Aug	1878	11 3/4	50,000
Dec	1878	11 3/4	50,000
Aug	1879	11 3/4	50,000
Dec	1879	11 3/4	25,000
Aug	1880	60	100,000
			\$3,272,100

Annual Report . .

P149467

THE WATER BOARD



1100

City of Cambridge

MASSACHUSETTS



City of Cambridge
Massachusetts

ANNUAL REPORT

THE WATER BOARD

1911

PRINTED BY THE CITY OF CAMBRIDGE



RECEIVED BY THE CITY OF CAMBRIDGE

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1865-1901.

CHESTER W. KINGSLEY	1865-1894	
JOHN SARGENT	1865-1871	
A. K. P. WELCH	1865-1871	
ROBERT DOUGLASS	1865-1871	
SAMUEL SLOCOMB	1865-1876	
Z. L. RAYMOND	1871	
HENRY L. EUSTIS	1871-1885	
J. WARREN MERRILL	1871-1881	
GEORGE P. CARTER	1871-1883	
JOHN H. LEIGHTON	1876-1879	
KNOWLTON S. CHAFFEE	1879-1889	
JAMES M. W. HALL	1881-1899	
LEANDER M. HANNUM	{ 1883-1884	
	{ 1885-1893	
JOHN F. O'BRIEN	1884-1895	
GEORGE H. HOWARD	1889-	(Now in Off
E. BURT PHILLIPS	1893-1896	
STILLMAN F. KELLEY	1894-	(Now in Off
FRANK A. ALLEN	1895-1899	
WELLINGTON FILLMORE	1896-	(Now in Off
EDMUND H. STEVENS	1899-	(Now in Off
WILLIAM B. DURANT	1899-	(Now in Off

Presidents of the Board.

J. WARREN MERRILL	1865-1867
EZRA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-

REPORT OF THE CAMBRIDGE WATER BOARD

CAMBRIDGE, DECEMBER 15, 1900

HONORABLE MEMBERS OF THE BOARD

THE CAMBRIDGE WATER BOARD, for the year ending November 30, 1900, respectfully submit to you the following report for your consideration:

During the year the Board has continued its efforts to secure the most efficient and economical management of the water supply of the city, and to improve the quality of the water. The Board has also continued its efforts to secure the most efficient and economical management of the water supply of the city, and to improve the quality of the water. The Board has also continued its efforts to secure the most efficient and economical management of the water supply of the city, and to improve the quality of the water.

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FINANCIAL STATEMENT FOR 1900

Amount received from the Water Works for the year ending November 30, 1900	\$ 1,000,000
Amount received from the City for the year ending November 30, 1900	1,000,000
Amount received from the State for the year ending November 30, 1900	1,000,000

WATER BOND ACCOUNT.

The whole amount of bonds outstanding is	\$3,302,100 00
Deducting from this sum the present value of the Water Debt Sinking Fund (not including the note of the City for \$200,000, which the Trustees of the Sinking Fund designated in their report of 1898, as the "Contingent Loan Obligation of the City of Cambridge," and which they omitted to mention in their report of 1899)	\$604,326 58
Leaves as the net Water Debt	\$2,697,773 42
Further details of the financial operations of the department will be found in the statement of the Registrar which accompanies this report. From that statement it will appear that the excess of receipts over expenditures during the past year is the sum of	
	\$14,332 11
The year 1899 closed with a small deficit of	\$240 27
The deficit of the year 1898 was	3,526 22
Total deficit to date	\$3,766 49
Of which \$240.27 is due the City Treasury and \$3,526.22 is due the Water Works on Construction account.	
Deducting these sums	\$3,766 49
Leaves as the net surplus on hand	\$10,565 62

FRESH POND.

During the year the Board sent in a communication to the City Council stating that there would be a "surplus of receipts over expenditures," and asking for an appropriation for the purpose of completing a portion of the unfinished work around Fresh Pond. The portion referred to is a part of the original plan of 1897, and is an addition to the driveway around Fresh Pond. It begins at the driveway near the fountain at the gate house, ascending the hill, at an easy grade, to Huron Avenue, until an elevation of sixty-five feet above the City base is reached, and then, leaving Huron Avenue, sweeps around a curve in the shape of an irregular ellipse, from parts of which an extensive and beautiful view of the pond appears through the shrubbery, and then returns to Huron Avenue. The borders of Fresh Pond are among the most attractive features of our Park System, although under care of the Water Board, and, of the many thousands who visit them, it is probable that no one regrets the expenditure of the funds necessary to beautify and adorn them: nor would any one regret such expenditure even if the money were raised by taxation, much less when the expenditure can be met, as in this case from surplus receipts. The Board regret that the City Council did not see fit to make the appropriation, which the Board requested, and trust that their recommendation, which they now renew,

[illegible]

of the last annual report of the Board events have shown that this statement is capable of demonstration. The following table shows the average daily consumption *per capita* in Cambridge during the past ten years :

1891	.	.	.	.	.	.	.	64.71 gallons.
1892	.	.	.	.	.	.	.	66. "
1893	.	.	.	.	.	.	.	74.50 "
1894	.	.	.	.	.	.	.	69.19 "
1895	.	.	.	.	.	.	.	71.65 "
1896	.	.	.	.	.	.	.	75.90 "
1897	.	.	.	.	.	.	.	76.46 "
1898	.	.	.	.	.	.	.	85.69 "
1899	.	.	.	.	.	.	.	87.16 "
1900	.	.	.	.	.	.	.	78.69 "

From this table it appears that, almost without exception, there has been a steady increase in consumption *per capita* from year to year, until we reach the year 1900. During that year the Board has set 270 meters, making the total number in use now 860, as compared with 619 in 1899, an addition of nearly one-third. In 1898, only 447 meters were in use, so that in the last two years the Board has nearly doubled the number of meters. The influence of these meters, few as they are, has been a striking object lesson. Nothing else can account for the decrease in consumption of 8.47 gallons *per capita* between 1899 and 1900. If, therefore, these few meters have reduced consumption to such an extent, it is plain, even without citing the experience of other cities, that a larger number of meters would still further reduce consumption, and thereby necessarily prolong the life of the system for many years. According to the latest report of the State Board of Health, there are eighty-two towns and cities in the Commonwealth which keep a record of their consumption of water. Some of these cities and towns use meters, others not, but the average daily consumption *per capita* of these eighty-two municipalities was, in 1899, only forty-nine gallons. The Metropolitan district, substantially unmetered, is included in this list. It is therefore a very conservative estimate which fixes the probable daily consumption of Cambridge, under a complete meter system, at forty-five gallons *per capita*. The experience of the Board in setting and taking readings from the meters, proves conclusively that the excess of consumption is almost wholly waste, caused by carelessness, or leaky water fixtures, and we have no reason to believe that any water taker will stint himself in the legitimate use of water merely because he takes it through a meter. In view of the fact that it

the first of these is the fact that the "out-
put" of the system is not the same as the
input. The second is the fact that the system
is not linear. The third is the fact that the
system is not time-invariant. The fourth is the
fact that the system is not causal. The fifth is
the fact that the system is not stable.

The first of these is the fact that the "out-
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system is not time-invariant. The fourth is the
fact that the system is not causal. The fifth is
the fact that the system is not stable.

to pay any rent charges, and there seems to be no justice in such a charge. If the charge is made at all, the amount should be paid into the Sinking Fund of the Water Works, rather than into the City Treasury.

The earlier statutes of the Commonwealth directed that all the surplus of the water receipts, after payment of expenses of maintenance, should be paid into the Sinking Fund of the Water Works. The sum now required to be paid into the Sinking Fund, in addition to interest, is $3\frac{1}{2}$ per cent. of the face value of the outstanding water bonds. If there is anything left, after these payments, and payment of the expenses of maintenance, and the surplus or any part of it is paid into the City Treasury, instead of into the Sinking Fund, under color of charges to the Water Board which are not legitimate, it is obvious that the general tax payers profit at the expense of the water takers. But many water takers are not tax payers, and large tax payers often pay no more water rates than small tax payers, and so an obvious injustice is done. The only equitable distribution of surplus receipts, after providing for the maintenance of the works, is by reducing water rates, as soon as the amount of the surplus justifies that course.

The possibility of a large issue of bonds, for the purpose of laying a new conduit, requiring larger interest and sinking fund payments, renders it unwise, however, to expect or anticipate any further reduction in water rates at present.

Respectfully submitted,

WILLIAM B. DURANT,	}	<i>Cambridge Water Board.</i>
GEORGE H. HOWARD,		
STILLMAN F. KELLEY,		
WELLINGTON FILLMORE,		
EDMUND H. STEVENS,		

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, DECEMBER 31, 1900

TO THE CITY OF CAMBRIDGE:

THE REGISTRAR HAS THE HONOR TO ACKNOWLEDGE THE RECEIPT OF THE CITY OF CAMBRIDGE, THROUGH THE BOARD OF WATER COMMISSIONERS, OF THE OPERATIONS OF THE WATER SUPPLY SYSTEM FOR THE YEAR 1900, AND TO REPORT THEREON TO THE CITY OF CAMBRIDGE, THROUGH THE BOARD OF WATER COMMISSIONERS, FOR THE YEAR 1900.

THE REGISTRAR HAS THE HONOR TO REPORT THAT THE WATER SUPPLY SYSTEM FOR THE YEAR 1900

Water supply	1,000,000
Water consumed	1,000,000
Water lost	1,000,000
Water sold	1,000,000
Water purchased	1,000,000
Water stored	1,000,000

THE REGISTRAR HAS THE HONOR TO REPORT THAT THE WATER SUPPLY SYSTEM FOR THE YEAR 1900

Water supply	1,000,000
Water consumed	1,000,000
Water lost	1,000,000
Water sold	1,000,000
Water purchased	1,000,000
Water stored	1,000,000

THE REGISTRAR HAS THE HONOR TO REPORT THAT THE WATER SUPPLY SYSTEM FOR THE YEAR 1900

Water supply	1,000,000
Water consumed	1,000,000
Water lost	1,000,000
Water sold	1,000,000
Water purchased	1,000,000
Water stored	1,000,000

There has been abated :—

Water rates, off and on, and seals	\$4,959 20
Supplies and repairs	171 42

There remains uncollected :—

Water rates	\$141 55
Meter rates	59 00
Supplies and repairs	561 71
Off and on	134 00
Seals	6 25
Maintenance account	726 30
Construction account	76 38
	<hr/>
	\$338,939 21

EXPENDITURES.

Construction account (general)	\$16,999 60
Construction account (Fresh Pond Reservoir)	55 25
Construction account (Hobbs Brook Reservoir)	2,585 63
Construction account (service of City Solicitor)	500 00
Maintenance account (general)	64,186 26
Maintenance account (rent of offices)	3,200 00
Supply account	5,789 73
	<hr/>
	\$93,266 49

ABATEMENTS.

Water rate bills to the amount of	\$4,959 20
Supply and repair bills to the amount of	171 42
	<hr/>
	\$5,130 62

REFUNDS.

Water rates to the amount of	\$2,941 95
Which amount deducted from receipts	322,421 32
	<hr/>
Leaves net receipts for water	\$319,479 37
Add off and on, fines, rents, seals, and Maintenance account	4,215 73
	<hr/>
Makes net receipts of rates, fines, etc.	\$323,695 10

OFF AND ON.

Water has been shut off for non-payment of rates, or per order on account of vacancy, and seals have been applied to fixtures by request of owners, as follows :—

Water shut off in 1900	743
Supplies let on, shut off in 1900	606
Supplies let on, shut off in previous years	84
New supplies let on	155
Seal locks applied to fixtures in 1900	1125
Seal locks removed, put on in 1900	553
Seal locks removed, put on in previous years	518

TABLE 1. Summary of water resources and water quality in the
 United States, 1950-1959

State	Area (sq. mi.)	Population (1950)	Water resources (1950)	Water quality (1950)
Alabama	52,420	1,500,000	1,000,000,000 gal. per day	Good
Alaska	587,811	40,000	1,000,000,000 gal. per day	Good
Arizona	113,990	1,000,000	1,000,000,000 gal. per day	Good
Arkansas	53,177	1,000,000	1,000,000,000 gal. per day	Good
California	158,333	3,500,000	1,000,000,000 gal. per day	Good
Colorado	104,237	1,000,000	1,000,000,000 gal. per day	Good
Connecticut	5,543	1,000,000	1,000,000,000 gal. per day	Good
Delaware	2,486	500,000	1,000,000,000 gal. per day	Good
District of Columbia	282	200,000	1,000,000,000 gal. per day	Good
Florida	55,561	1,500,000	1,000,000,000 gal. per day	Good
Georgia	59,260	1,500,000	1,000,000,000 gal. per day	Good
Hawaii	10,931	200,000	1,000,000,000 gal. per day	Good
Idaho	82,730	1,000,000	1,000,000,000 gal. per day	Good
Illinois	149,995	3,500,000	1,000,000,000 gal. per day	Good
Indiana	36,422	2,500,000	1,000,000,000 gal. per day	Good
Iowa	72,595	2,000,000	1,000,000,000 gal. per day	Good
Kansas	81,757	1,000,000	1,000,000,000 gal. per day	Good
Kentucky	40,327	2,000,000	1,000,000,000 gal. per day	Good
Louisiana	52,332	1,500,000	1,000,000,000 gal. per day	Good
Maine	33,092	500,000	1,000,000,000 gal. per day	Good
Maryland	12,178	1,000,000	1,000,000,000 gal. per day	Good
Massachusetts	8,007	2,000,000	1,000,000,000 gal. per day	Good
Michigan	96,716	3,500,000	1,000,000,000 gal. per day	Good
Minnesota	225,179	2,500,000	1,000,000,000 gal. per day	Good
Mississippi	46,821	1,500,000	1,000,000,000 gal. per day	Good
Missouri	69,707	2,500,000	1,000,000,000 gal. per day	Good
Montana	147,040	1,000,000	1,000,000,000 gal. per day	Good
Nebraska	77,345	1,000,000	1,000,000,000 gal. per day	Good
Nevada	110,611	1,000,000	1,000,000,000 gal. per day	Good
New Hampshire	9,349	500,000	1,000,000,000 gal. per day	Good
New Jersey	8,722	2,500,000	1,000,000,000 gal. per day	Good
New Mexico	121,670	1,000,000	1,000,000,000 gal. per day	Good
New York	47,155	5,500,000	1,000,000,000 gal. per day	Good
North Carolina	50,814	2,500,000	1,000,000,000 gal. per day	Good
North Dakota	69,862	1,000,000	1,000,000,000 gal. per day	Good
Ohio	44,826	3,500,000	1,000,000,000 gal. per day	Good
Oklahoma	69,562	1,000,000	1,000,000,000 gal. per day	Good
Oregon	24,076	1,000,000	1,000,000,000 gal. per day	Good
Pennsylvania	46,081	4,500,000	1,000,000,000 gal. per day	Good
Rhode Island	1,545	500,000	1,000,000,000 gal. per day	Good
South Carolina	32,020	1,000,000	1,000,000,000 gal. per day	Good
South Dakota	77,097	1,000,000	1,000,000,000 gal. per day	Good
Tennessee	42,328	2,500,000	1,000,000,000 gal. per day	Good
Texas	69,562	2,500,000	1,000,000,000 gal. per day	Good
Utah	84,887	1,000,000	1,000,000,000 gal. per day	Good
Vermont	9,616	500,000	1,000,000,000 gal. per day	Good
Virginia	40,775	2,500,000	1,000,000,000 gal. per day	Good
Washington	71,302	1,500,000	1,000,000,000 gal. per day	Good
West Virginia	24,061	1,000,000	1,000,000,000 gal. per day	Good
Wisconsin	65,498	2,500,000	1,000,000,000 gal. per day	Good
Wyoming	97,813	1,000,000	1,000,000,000 gal. per day	Good

COMPARATIVE STATEMENT.

	1899		1900	
CONSTRUCTION ACCOUNT. (HOBBS BROOK RESERVOIR.)				
<i>Received.</i>				
From bonds issued.....	\$13,500 00		\$9,500 00	
From sale of grass, feed, old material, etc.....	65 00	\$13,565 00		\$9,500 00
<i>Expended.</i>				
Construction of reservoir, land settlement, etc.....	\$11,874 17		\$2,585 65	
Services of City Solicitor.....			500 00	
Balance of appropriation.....	1,690 83	\$13,565 00	6,414 35	\$9,500 00
CONSTRUCTION ACCOUNT. (FRESH POND LAND.)				
<i>Received.</i>				
From bonds issued.....	\$500 00	\$500 00		
<i>Expended.</i>				
Settlement for land taken, etc.....	\$415 00			
Balance of appropriation.....	85 00	\$500 00		
CONSTRUCTION ACCOUNT. (FRESH POND RESERVOIR.)				
<i>Received.</i>				
From bonds issued.....		\$1,000 00	\$500 00	\$500 00
<i>Expended.</i>				
For work at Fresh Pond.....	\$987 92		\$55 25	
Balance of appropriation.....	2 08	\$1,000 00	444 75	\$500 00
CONSTRUCTION ACCOUNT. (GENERAL.)				
<i>Received.</i>				
From bonds issued.....	\$33,500 00		\$20,000 00	
From premium on bonds.....			1,960 80	
From sale of pipe, fittings, etc.....	1,295 00	\$34,795 00	62 10	\$22,022 90
<i>Expended.</i>				
Sundry bills and pay rolls.....	\$33,364 00		\$16,979 60	
Balance of appropriation.....	1,431 00	\$34,795 00	5,023 30	\$22,022 90
SUPPLY ACCOUNT.				
<i>Received.</i>				
From pipe and labor on supplies.....		\$6,592 26		\$5,404 25
<i>Expended.</i>				
Sundry bills for stock and labor.....		6,346 06		5,739 73
Excess of receipts.....		\$246 20		
Expenditures, excess of.....				\$335 48
MAINTENANCE ACCOUNT.				
<i>Received.</i>				
From "rates, fines, etc.".....	\$303,796 75		\$320,612 37	
From sale of grass, old materials, etc.....	1,830 00		3,082 73	
Accrued interest on water bonds sold.....			61 25	
		\$305,626 84		\$323,756 33
<i>Expended.</i>				
Care and repairs.....	\$61,690 81		\$64,186 26	
Interest on water debt.....	139,674 50		127,179 00	
Sinking fund requirements.....	113,718 50		114,523 50	
Rent of offices.....			3,200 00	
		\$305,083 31		\$309,088 76
Deficit in receipts.....		\$486 47		
Excess of receipts.....				\$14,667 59

COMPARATIVE STATEMENT.—*Continued.*

1899	Maintenance account, excess of expenditures.....	\$486 47	
	Supply account, excess of receipts.....	246 20	
	Excess of total expenditures over total receipts.....		\$240 27
1900	Maintenance account, excess of receipts	\$14,667 59	
	Supply account, excess of expenditures.....	835 48	
	Excess of total receipts over total expenditures.....		\$14,853 11

From the excess of receipts shown above, amounting to \$14,332.11, has been deducted the amount of the deficit of the past two years (\$3,766.49), and the balance of excess receipts, \$10,565.62, has been carried to the sinking fund as required by law.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 19,993 families, 798 stables, 2,964 horses, 178 cows, 286 shops and 626 stores and offices, by the following fixtures, viz:—

23,747 faucets,	71 urinals,
8,736 wash basins,	13 yard hydrants,
11,728 wash tubs,	5 fountains,
7,733 bath tubs,	31 tumbler washers,
262 slop closets,	2,167 hand hose,
20,325 pan closets,	10 motors.
2 hopper closets,	

Also,

- 968 fire hydrants (beside 19 on private premises).
- 8 fire reservoirs.
- 28 drinking fountains in public squares.
- 59 street watering standpipes.
- 4 public sanitarries.

The above schedule of fixtures does not include those in schoolhouses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made with very satisfactory results.

Respectfully submitted,

WALTER H. HARDING,
Registrar.

COMPARATIVE STATEMENT.

	1899		1900	
CONSTRUCTION ACCOUNT. (HOBBS BROOK RESERVOIR.)				
<i>Received.</i>				
From bonds issued.....	\$13,500 00		\$9,500 00	
From sale of grass, feed, old material, etc.....	65 00			
		\$13,565 00		\$9,500 00
<i>Expended.</i>				
Construction of reservoir, land settlement, etc.....	\$11,874 17		\$2,585 65	
Services of City Solicitor			500 00	
Balance of appropriation.....	1,690 83		6,414 35	
		\$13,595 00		\$9,500 00
CONSTRUCTION ACCOUNT. (FRESH POND LAND.)				
<i>Received.</i>				
From bonds issued.....	\$500 00			
		\$500 00		
<i>Expended.</i>				
Settlement for land taken, etc.....	\$415 00			
Balance of appropriation.....	85 00			
		\$500 00		
CONSTRUCTION ACCOUNT. (FRESH POND RESERVOIR.)				
<i>Received.</i>				
From bonds issued.....		\$1,000 00	\$500 00	
				\$500 00
<i>Expended.</i>				
For work at Fresh Pond.....	\$997 92		\$55 25	
Balance of appropriation.....	2 08		444 75	
		\$1,000 00		\$500 00
CONSTRUCTION ACCOUNT. (GENERAL.)				
<i>Received.</i>				
From bonds issued.....	\$33,500 00		\$20,000 00	
From premium on bonds			1,960 80	
From sale of pipe, fittings, etc.....	1,295 00		62 10	
		\$34,795 00		\$22,022 90
<i>Expended.</i>				
Sundry bills and pay rolls.....	\$33,364 00		\$16,979 60	
Balance of appropriation.....	1,431 00		5 023 30	
		\$34 795 00		\$22,022 90
SUPPLY ACCOUNT.				
<i>Received.</i>				
From pipe and labor on supplies		\$6,592 26		\$5,404 25
<i>Expended.</i>				
Sundry bills for stock and labor....		6,346 06		5,739 73
Excess of receipts.....		\$246 20		
Expenditures, excess of.....				\$335 48
MAINTENANCE ACCOUNT.				
<i>Received.</i>				
From "rates, fines, etc"	\$303,796 75		\$320,612 37	
From sale of grass, old materials, etc	1,830 09		3,082 73	
Accrued interest on water bonds sold.....			61 25	
		\$305,596 84		\$323,756 33
<i>Expended.</i>				
Care and repairs.....	\$61,690 81		\$64,186 26	
Interest on water debt.....	130,674 00		127,179 00	
Sinking fund requirements.....	113,718 50		114,523 50	
Rent of offices			3,200 00	
		\$306,083 31		\$309,088 76
Deficit in receipts.....		\$486 47		
Excess of receipts.....				\$14,667 59

Summary of Statement - *Continued*

22	Balance forward, by date of expenditure	\$448 47
	Receipts previous to date of receipts	200 20
	Balance of date expenditures exceed receipts	\$248 27
23	Balance forward, by date of receipts	\$14,332 11
	Receipts previous to date of expenditures	225 00
	Balance of date receipts exceed expenditures	\$14,557 11

The balance of receipts shown above, amounting to \$14,332 11, has been applied to the amount of the deficit of the past two years. By the balance of date of excess receipts, \$10,565 62, has been carried forward to the next period to law.

The water supply to the manufacturing, business blocks, houses, etc., supplied by the city water is supplied to 19,203 families, 798 stables, 24,000 shops and 6,200 stores and offices, by the following list of fixtures:

1000 fountains	71 urinals,
1000 wash basins	12 yard hydrants,
1000 water tubs	5 fountains,
1000 water closets	31 tumbler washers,
1000 water meters	2 107 hand hose,
1000 water pumps	10 motors

- 1000 hydrants, 1000 private premises
- 1000 fire engines
- 1000 fountains in public squares
- 1000 watering standpipes
- 1000 water towers

The water supply to the fixtures is not to be used in a household, but to be used in a public square, or where the use of the water is not for domestic purposes.

The water supply to the fixtures has been made with very satisfactory results.

Respectfully submitted,

WALTER H. HARDING,

Register

CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER,
December 1, 1900.

To the Cambridge Water Board :

GENTLEMEN:—I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1900.

Gross collections for account of Water Works, "Rates, Fines, etc." .	\$328,513 52
Abatement certificates received and paid on "Water Rates" . . .	4,959 20
Gross collections for account of Water Works, "Supply Account" .	5,575 67
Abatement certificates received and paid on "Supply Account" .	171 42
"Refund" certificates have been presented and paid to the amount of	2,941 95
Uncollected bills in my hands November 30, 1900, for account of "Maintenance," "Construction" and "Water Rates," amount to .	1,143 48
Uncollected bills in my hands November 30, 1900, for account of "Supplies, Repairs, etc.," amount to	561 71
Gross collections for account of Water Works, "Construction" .	62 10
Gross collections for account of Water Works, "Maintenance" .	3,082 73

Very respectfully,

WM. W. DALLINGER,
City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM,
City Auditor.

REPORT OF THE SUPERINTENDENT OF WATER WORKS

Cambridge, December 1, 1900.

TO THE CITY COUNCIL OF THE CITY OF CAMBRIDGE.

In compliance with the provisions of the City Ordinance, I herewith submit to you the following report of the Superintendent, for the year ending November 30, 1900.

CONSUMPTION

Amount of water pumped during the past year	2,451,277.240 gallons.
Average water pumped during the past year	7,943,773 "
Amount of water consumed by meter	716,613.392 "
Amount of water used for sprinkling streets	51,142.940 "
Amount of water used for flushing sewers	1,230,000 "
Amount of water used for running sanitation	2,500,000 "
Amount of water used for drinking fountains	13,000,000 "
	—
Total	651,565.192 gallons
Amount of water consumed by meter	1,791,712.048 gallons

Number of gallons daily for each inhabitant on the total amount consumed.

Number of gallons daily for each inhabitant on the total amount consumed, exclusive of water for private stables, homes, and other uses and for purposes of fire.

ANALYSIS OF STATEMENT OF TOTAL PUMPING DURING THE PAST TEN YEARS

Year	Total Pumping	Increase or Decrease	Average Pumping	Increase or Decrease	Percentage to each inhabitant
1891	1,000,000	100,000	100,000	100,000	100%
1892	1,100,000	100,000	110,000	100,000	110%
1893	1,200,000	100,000	120,000	100,000	120%
1894	1,300,000	100,000	130,000	100,000	130%
1895	1,400,000	100,000	140,000	100,000	140%
1896	1,500,000	100,000	150,000	100,000	150%
1897	1,600,000	100,000	160,000	100,000	160%
1898	1,700,000	100,000	170,000	100,000	170%
1899	1,800,000	100,000	180,000	100,000	180%
1900	1,900,000	100,000	190,000	100,000	190%

**COMPARATIVE STATEMENT OF DOMESTIC PUMPING DURING THE PAST
TEN YEARS.**

Date.	Domestic Yearly Pumping.	Increase or Decrease.	Average Daily Pumping.	Increase or Decrease.	Gallons to each inhabit- ant daily.
1891.....	1,270,360,425	53,298,413 increase.	3,480,439	146,023 increase.	46.24
1892.....	1,426,400,135	156,039,710 "	3,897,268	40,829 "	48.00
1893.....	1,668,235,574	241,835,439 "	4,570,509	673,241 "	55.61
1894.....	1,547,943,977	120,291,597 decrease.	4,240,942	329,567 decrease.	50.34
1895.....	1,530,152,817	17,791,160 "	4,192,199	48,743 "	50.04
1896.....	1,730,224,007	200,071,190 increase.	4,727,388	535,189 increase.	54.42
1897.....	1,740,357,346	10,133,339 "	4,768,102	40,714 "	54.50
1898.....	2,064,438,585	324,081,239 "	5,655,996	887,894 "	63.35
1899.....	2,085,998,805	21,560,220 "	5,715,070	59,074 "	63.08
1900.....	1,799,732,048	286,266,757 decrease	4,930,772	784,298 decrease.	53.42

Total amount of coal consumed (in pounds)	3,866,975
Daily average coal consumed (in pounds)	10,594
Coal consumed per million gallons pumped	1,458
Highest water elevation in Fresh Pond was on April 23	17.46
Lowest water elevation in Fresh Pond was on September 16	13.96
Average height of water in Fresh Pond	15.47
Highest water elevation in Stony Brook Reservoir was on March 2	82.81
Lowest water elevation in Stony Brook Reservoir was on July 9	77.04
Highest water elevation in Hobbs Brook Reservoir No. 1, Lincoln Street, was on March 17	182.08
Lowest water elevation in Hobbs Brook Reservoir No. 1, Lincoln Street, was on September 13	179.68
Highest water elevation in Hobbs Brook Reservoir No. 2, Winter Street, was on March 17	181.85
Lowest water elevation in Hobbs Brook Reservoir No. 2, Winter Street, was on January 10	175.10
Total rainfall at Fresh Pond Pumping Station	46.89
Total rainfall at Stony Brook Reservoir	51.34
Total rainfall at Hobbs Brook Reservoir	45.89

TOTAL RAINFALL FOR THE PAST TEN YEARS.

Month	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
December.....	4.40	6.78	1.23	5.23	4.43	1.90	1.63	4.31	2.	1.30
January.....	6.68	4.32	1.87	3.05	3.57	2.46	3.32	4.75	3.55	4.40
February.....	4.61	2.46	6.43	2.91	1.07	5.62	2.36	3.61	3.99	7.34
March.....	5.74	3.56	2.50	.84	2.68	4.87	2.66	2.08	5.94	5.10
April.....	2.72	.77	3.25	2.94	4.15	1.70	2.82	6.22	1.32	1.90
May.....	2.44	6.06	7.30	4.63	2.39	2.42	4.24	3.92	.77	5.53
June.....	4.01	4.23	2.18	.81	2.76	2.83	5.16	1.83	3.17	2.75
July.....	3.06	2.53	2.26	2.88	3.28	2.65	4.68	4.50	3.12	3.31
August.....	3.68	6.11	5.95	1.03	4.71	2.45	5.06	7.34	3.31	3.90
September.....	2.73	1.84	1.76	2.40	1.83	6.29	3.22	1.78	4.63	4.40
October.....	5.10	2.15	3.77	5.19	10.16	3.10	.55	7.23	3.06	3.75
November.....	3.08	4.04	1.99	3.34	6.09	3.53	6.83	4.93	3.20	5.23
Total.....	48.25	44.85	40.49	35.85	47.12	38.82	42.53	52.42	37.33	46.89

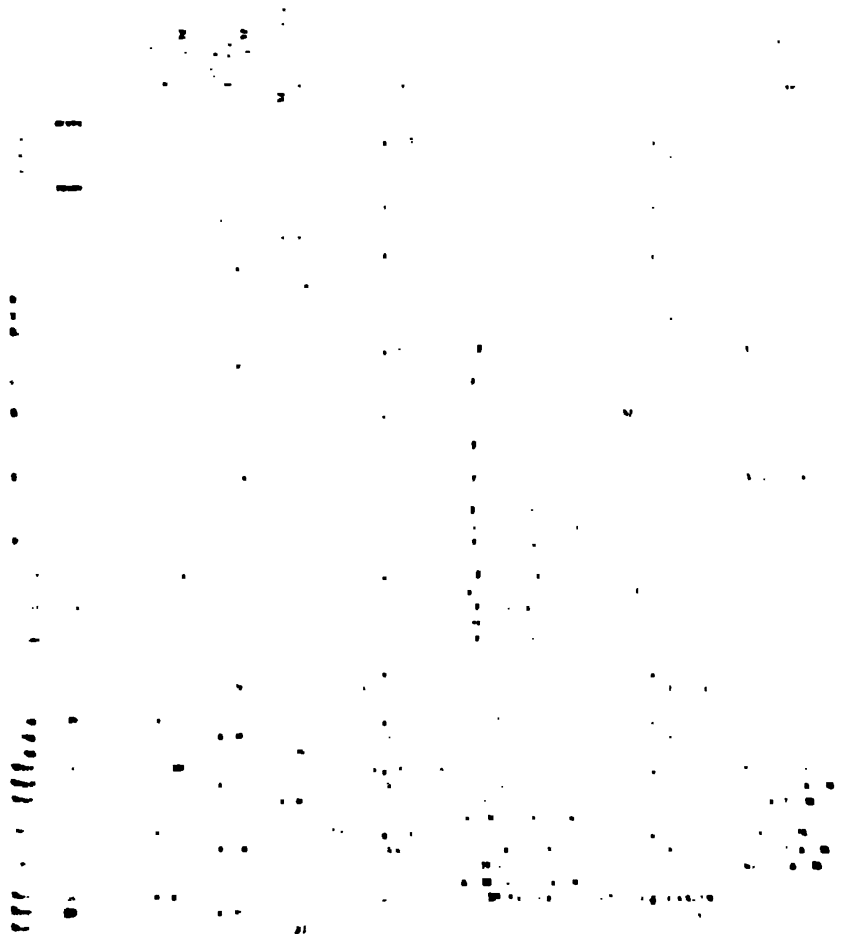
CONSTRUCTION AND SURROUNDINGS

The construction of the building is of the most substantial character, and the materials used are of the best quality. The building is situated on a high and dry site, and is surrounded by a high wall, which is topped by a crenellated parapet. The building is of a rectangular shape, and is divided into a number of rooms, which are arranged in a symmetrical plan.

The building is of a two-story construction, and the roof is of a gabled type. The walls are of a light color, and the windows are of a small size. The building is surrounded by a high wall, which is topped by a crenellated parapet. The building is situated on a high and dry site, and is surrounded by a high wall, which is topped by a crenellated parapet.

THE BUILDING

PLAN



PUMPING STATION AND GROUNDS.

Engine No. 7 has had some slight repairs during the year and coils have been put into the second receiver in place of the tubes which were giving trouble from leaking. The machinery at the Station is in good condition and is performing very satisfactorily.

On November 14th the forty-inch to thirty-six inch flange reducer on the pumping main near the pumping Station broke at the flange; this necessitated pumping direct, with the Worthington and Blake engines, while repairs were being made.

The coal shed, two of the dwelling houses and the stable have been painted. The grounds have received the usual care and are in fair condition.

HIGHLAND STREET RESERVOIR.

The property remains in the same condition as at the last report. The grass on the banks has been cut and the walks cared for.

PAYSON PARK RESERVOIR.

The strainers on the outlet pipes from both basins, which were broken by the anchor ice last winter, have been replaced with copper ones and both basins cleaned out.

The twelve-inch pipe drain connected with the under-drains and mud-pipes has been extended about five hundred (500) feet through the land of the Hittinger Fruit Company. The banks and walks have received the usual care.

PIPE YARD.

The buildings at the pipe yard are in good condition, but will need painting the coming year.

PIPE BRIDGES.

The two twelve-inch lines of pipe across the new bridge over the Fitchburg Railroad at Massachusetts Avenue have been put in, connecting with the sixteen-inch main in Massachusetts Avenue on the north side of the bridge, and the ten-inch line on the south side.

HIGH SERVICE.

No extension has been made on the high service system during the year.

Following will be found a list of the streets that are at date supplied by the high service, November 30, 1900.

Quincy Street	Hillside Avenue
Quincy Street, from Front Street to Belmont Street and Quincy Street	Holly Avenue
Quincy Street	Humbolt Street
Quincy Street	Huron Avenue, from Appleton Street to Raymond Street
Quincy Street	Lancaster Street
Quincy Street	Linneman Street
Quincy Street	Masson Street
Quincy Street, from Appleton Street to Walden Street	Massachusetts Avenue, from Garden Street to Quincy Street
Quincy Street	Massachusetts Avenue, from near Ironbridge Street to Dana Street
Quincy Street	Mount Pleasant Street
Quincy Street	Mount Vernon Street
Quincy Street	Quincy Street, from Harvard Street to Broadway
Quincy Street, from Massachusetts Ave- nue to Belmont Street	Raymond Street, from Linneman Street to Walden Street
Quincy Street, from Massachusetts Avenue to Mount Pleasant Street	Reverdy Street, from Highland Street to Federal Avenue
Quincy Street, from Massachusetts Ave- nue to Belmont Street	Sparks Street, from Huron Avenue to Front Street
Quincy Street, from Huron Avenue to Linneman Street	Upland Road, from Hillside Avenue to Huron Avenue
Quincy Street, from Walden Street to Belmont Street and Avenue	Vandal Lane, from Huron Avenue to Vincent Street
Quincy Street, from Quincy Street to Front Street	Walnut Avenue
Quincy Street, from Quincy Street to Front Street	Ware Street
Quincy Street	Washington Avenue

LIST OF CHECK VALVES IN USE

- At the intersection at Huntington Street
- At the intersection at Linneman Street
- At the intersection at Quincy Street, from Front Street to near College Avenue, from
Quincy Street to Broadway
- At the intersection at Linneman Street
- At the intersection at Huron Street
- At the intersection at the hundred feet west from Massachusetts Avenue,
Quincy Street at Harvard Street
- At the intersection at Linneman Street
- At the intersection at Walden Street
- At the intersection at the Quincy Street, from the check valves have been used at Har-
vard Street, west end from Huntington Street, Lexington Avenue, Kirkland
Avenue and Harvard Street

These valves have not been in use for several years.

LEAKAGE

There was no leakage after the 1922-23 season and the 1923-24 season.

1925

The amount of this year's leaks or leaks that of 1922-23, which was
a record annual report—to one hundred ninety three (193),

The special inspection, instituted last year for the detection of leaks has been continued with the above satisfactory results.

As in former years, the usual notice has been sent to the owners or occupant of premises where the waste has been discovered and the defects have been promptly attended to.

Twenty-five hundred seven (2,507) were found on the premises :—of these twenty-four hundred ninety-six (2,496) were reported by the inspectors.

One hundred thirty-one (131) were found in the streets :—

Three (3) on four-inch mains.

Three (3) on six-inch mains.

One (1) on eight-inch main.

Five (5) on ten-inch main.

Two (2) on twelve-inch mains.

One (1) on forty-inch main.

One (1) on forty by thirty-six inch reducer in gate chamber at Pumping Station.

One (1) on hydrant.

One (1) on fountain.

The leak on the forty-inch main is the first that has occurred on our forty-inch steel main :—it was located in the branch for the regulator valves on Huron Avenue.

The leak in the gate chamber just outside of the Pumping Station necessitated a change in the system of pumping and for seven days the City was supplied by pumping direct.

Ten (10) leaks have been caused by electrolysis this year :—the expense of the repairs has been charged to the Boston Elevated Railway Company as per agreement.

TABLE SHOWING A GAIN OR LOSS IN TOTAL CONSUMPTION FOR THE YEAR 1900 OVER THE YEAR 1899.

	Total Consump- tion 1900.	Total Consump- tion 1899.	Increase or Decrease, + or —.
December	204,553,360	250,330,840	—45,767,480
January	243,173,020	265,448,480	—22,274,560
February	199,942,120	269,707,680	—69,765,560
March	229,562,080	233,806,320	—4,244,240
April	201,539,360	211,354,880	—9,815,520
May	195,051,120	239,712,880	—44,661,760
June	225,405,400	259,134,040	—33,728,640
July	274,256,400	278,324,200	—4,067,800
August	226,855,640	242,380,280	—15,524,640
September	224,104,760	226,769,400	—2,664,640
October	224,248,580	210,751,390	+13,497,190
November	202,584,500	194,960,040	+7,624,460
Total	2,651,277,240	2,882,570,430	—231,293,190

MASS FIVE

Some of the larger pipes, those eighty six (86) feet of main pipe have
been replaced with a larger size of pipe. In addition twelve (12) feet were
removed from the line and replaced with a larger size. The seventy four (74) feet were
removed from the line and the quarter inch to sixteen inch

the bridge formerly located on Brinkline Street
and the bridge over the Brinkline Bridge has been moved in
the street from Brinkline Street to Waverly Street, and in Waverly
Street to A Street. This paper was removed from
the file in 1971.

The new line from Market Street Avenue, west to Pacific Street, will be a single track line and connected through Pacific Street with a new eight-inch main. The new line will be a relief for the city for many years to come.

On the morning of the 11th of June, 1892, the first of the street cars in Massachusetts was run. It was a horse-drawn car, and the first of the modern electric cars was run on the 15th of June, 1892. The first of the modern electric cars was run on the 15th of June, 1892. The first of the modern electric cars was run on the 15th of June, 1892.

On 11/11/1994, the following information was obtained from the New York City Police Department, New York City, New York:

1. Address _____ Street at _____ Mass. _____
City _____ State _____

[illegible]

W. H. A. M. van der Meulen, *Streeklucht*

[illegible]

1. The first step is to identify the problem. This involves understanding the current situation and the goals that need to be achieved.

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

The size, length and weight of main cast-iron pipe laid during the year are as follows : —

Size.	Length in Feet.	Weight in Tons.
16-inch	1,486½	89.58
12-inch	1,656	64.31
10-inch	1,289	47.18
8-inch	2,182	46.75
6-inch	2,023	29.80
4-inch	861	7.30

All the hydrants and blow-offs were thoroughly blown off during the months of May and June and the same course will be pursued if possible during the coming months this winter. At the same time all main pipes throughout the City were carefully tested for leakage.

MAIN PIPE LAID, NUMBERS OF GATES AND FIRE HYDRANTS.

	IRON PIPE.		GATES.		HYDRANTS.	
	Length.	Size.	No.	Size.	No.	Kind.
	Feet.	Inch.		Inch.		
Albany St., from Mass. Ave. to Pacific.....	1,245	12				
" at Pacific, east.....			1	12		
" 310 feet east from Pacific.....	9	6			1	Chapman.
" 638 " east from Pacific.....			1	12		
" 704 " east from Pacific.....	9	6			1	Chapman.
" 64 " west from Mass. Ave. on blow off.....			1	6		
Amherst Ave., from Mass. Ave., west.....	305	6				
" at Mass. Ave., west.....			1	6		
" across Mass. Ave., west.....	75	6				
" at Mass. Ave., east of 10-inch.....			1	6		
" at Mass. Ave., east of 8-inch.....			1	6		
Baldwin St., 373 feet from Cambridge.....	6	6			1	Chapman.
Berkeley Place.....	72	4				
Berkshire Place, blow off.....	14	4				
Bird St., from Cushing Ave.....	219	6				
" at Cushing Ave.....			1	6		
" midway between Belmont and Cushing Ave.....	6	6			1	Chapman.
Cambridge St., at Fifth.....	3	8	1	8		
Camp St., from Fair Oaks.....	60	6				
Cushing Ave., from Bird, east.....	243	6				
" from Bird, west.....	221	4				
" at Bird, west.....			1	4		
Dana St., at Broadway.....	2	10				
" ".....	7	6			1	Chapman.
East St., blow off.....	2	4				
Fair Oaks St., from Cameron.....	258	6				
" at Cameron.....		1	6			
First St., at Thorndike.....	3	12				
" ".....	25	6			1	Boston.
Gorham St., at Wendell.....	7	6			1	Chapman.
Green St., 17 feet from Putnam Ave.....	174	6			1	Chapman.
" 781 feet from Putnam Ave.....	174	6			1	Chapman.
" from Lansdowne.....	81	6				
" at Lansdowne.....			1	6		
" between Lansdowne and Blanche.....	19	6			1	Chapman.
Holworthy Place, from Park Ave.....	121	4				
" at Park Ave.....			1	4		
Inman Place, from Jones Alley.....	51	14				
Kirkland St., at Cambridge.....	4	10	1	10		
Lowland Ave.....	36	2				

U. S. G. P. O. W. H. I. T. E. S. U. N. D. E. R. T. H. E. U. N. I. T. E. D. N. A. T. I. O. N. A. L. I. D. E. N. T. I. F. I. C. A. T. I. O. N. A. C. T. 1952

Name		Age	Sex	Mar	No	Rel
1	Chapman	1	M			
2	Chapman	2	M			
3	Chapman	3	M			
4	Chapman	4	M			
5	Chapman	5	M			
6	Chapman	6	M			
7	Chapman	7	M			
8	Chapman	8	M			
9	Chapman	9	M			
10	Chapman	10	M			
11	Chapman	11	M			
12	Chapman	12	M			
13	Chapman	13	M			
14	Chapman	14	M			
15	Chapman	15	M			
16	Chapman	16	M			
17	Chapman	17	M			
18	Chapman	18	M			
19	Chapman	19	M			
20	Chapman	20	M			
21	Chapman	21	M			
22	Chapman	22	M			
23	Chapman	23	M			
24	Chapman	24	M			
25	Chapman	25	M			
26	Chapman	26	M			
27	Chapman	27	M			
28	Chapman	28	M			
29	Chapman	29	M			
30	Chapman	30	M			
31	Chapman	31	M			
32	Chapman	32	M			
33	Chapman	33	M			
34	Chapman	34	M			
35	Chapman	35	M			
36	Chapman	36	M			
37	Chapman	37	M			
38	Chapman	38	M			
39	Chapman	39	M			
40	Chapman	40	M			
41	Chapman	41	M			
42	Chapman	42	M			
43	Chapman	43	M			
44	Chapman	44	M			
45	Chapman	45	M			
46	Chapman	46	M			
47	Chapman	47	M			
48	Chapman	48	M			
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90	Chapman	90	M			
91	Chapman	91	M			
92	Chapman	92	M			
93	Chapman	93	M			
94	Chapman	94	M			
95	Chapman	95	M			
96	Chapman	96	M			
97	Chapman	97	M			
98	Chapman	98	M			
99	Chapman	99	M			
100	Chapman	100	M			

SUPPLIES.

Following is the list of establishments having fire supplies from the City of Cambridge :

American Rubber Co.,	Binney street,	Two 6-in.
American Net & Twine Co.,	Third street,	6-in.
Barber Asphalt Paving Co.,	First street,	6-in.
Bay State Metal Works,	Harvard street,	6-in.
Blacker & Shepard,	Osborn street,	2-in.
Blake, Geo. F. Manufacturing Co.,	Third street,	4-in.
Boston Book Binding Co.,	Mt. Auburn street,	6-in.
Boston Elevated Railway Co.,	Baldwin street,	2-in. & 4-in.
" " " "	Cambridge street,	Two 2-in.
" " " "	Pelham street,	3-4-in.
" " " "	Massachusetts ave.,	4-in.
" " " "	Mt. Auburn street,	2-in. & 4-in.
" " " "	Murray street,	4-in.
" " " "	River street,	4-in.
Boston & Maine Railroad Co.,	Bridge street,	4-in.
" " " "	Bridge street,	6-in.
" " " "	Prison Point street,	4-in.
Boston Woven Hose & Rubber Co.,	Portland street,	10-in. & 8-in.
Chelmsford Foundry Co.,	Portland street,	2-in.
Davis, Curtis & Co.,	Broadway,	6-in.
Davis, James C. & Co.,	Broadway,	4-in. & 6-in.
Dover Stamping Co.,	Pleasant street,	6-in.
Dow, John C. & Co.,	Portland street,	2-in.
Fogarty & Daly,	Massachusetts ave.,	4-in.
Ginn & Co.,	First street,	Two 6-in. One 8-in.
Goepper Bros.,	Ninth street,	1 1-2-in.
Harvard College, Memorial Hall,	Cambridge street,	4-in.
Harvard College, Observatory,	Concord avenue,	1-in.
Holy Ghost Hospital for Incurables,	Hovey avenue,	3-in.
Houghton, Mifflin & Co.,	Albro & Blackstone sts.,	Two 6-in.
Irving & Casson,	First street,	Two 6-in.
" " " "	Otis street,	
" " " "	Thorndike street,	
" " " "	Thorndike street,	2-in.
Ivers & Pond Piano Co.,	Albany street,	4-in.
Jones, C. L. & Co.,	Pearl street,	4-in.
Keeler & Co.,	Thorndike street,	1-in.
Kendall, Edward & Sons,	Main street,	2-in.
Lamb & Ritchie,	Albany street,	6-in.
Laminer Fibre Co.,	Tannery street,	2-in.
Liquid Air, Power & Automobile Co.,	Albany street,	4-in.
Lockhart, William L.,	Bridge street,	1 1-2-in.
Luke, E. H. Estate of,	Main street,	2-in.
Mason & Hamlin Co.,	Broadway,	6-in.
Massachusetts Athletic Association,	Lausdowne street,	4-in.
Metropolitan Storage Warehouse Co.,	Massachusetts avenue,	6-in.
Middlesex County, House of Correction,	Second & Springs sts.,	6-in.
Morss & Whyte,	Auburn street,	3-in.
" " " "	Auburn street,	6-in.

Franklin street,	6 in
Franklin street,	6 in
Green street,	6 in
Warner street,	6 in
Hampden street,	6 in & 10 in
601 Main street,	6 in
Washington street,	2 in
Kennard street,	6 in
Water street,	6 in
Water street,	6 in
Patham avenue,	6 in
Thorn like street	6 in
Third street	6 in
First street,	6 in
Broadway,	2 in
Main street,	2 in
Hampden street	6 in
Lagers street	6 in
South street,	6 in
Pittier street	6 in
Broadway,	6 in
Broadway,	6 in
London street	6 in
Spring Pine	6 in

- 1 1 1 1 1 -

The total amount of paper supplied during the year was 1,000,000 sheets. Of this, 500,000 have been used for the construction of new buildings and 500,000 for the repair of old buildings. The paper for the repair of old buildings is supplied by the Government and the paper for the construction of new buildings is supplied by the private paper mills.

1. *Chlorophyll a* (Chl *a*) is the primary photosynthetic pigment in most algae and higher plants. It is a green pigment that absorbs light energy in the blue and red regions of the visible spectrum.

[illegible][illegible]

1. The "Street of the Future" Street at Market with Avenue
running from the New York City to the old city and the future
city.

[illegible][illegible]

On March 11, 1968, the following information was received from the
New York City Police Department, New York City, New York:

Wm. J. ...

connected with our system. This firm formerly used salt water for fire purposes.

During the annual spring inspection of sidewalk shut offs the service boxes were lowered where they had been affected by the frost.

Special attention has been directed to those in the following streets where they have been raised :—Arnold Circle, Berkshire Street, Brookline Street, Charles River Road, Fairfield Street, Gray Street, Hastings Street, Hayes Court, Munroe Street, Myrtle Avenue, Ninth Street, Pemberton Street, Porter Circle, Potter Park, Porter Road, Putnam Court, Richdale Avenue, Saint Paul Street, Sidney Street and Tremont Street.

And in the locations following where they have been lowered :—Berkshire Street, Brewster Street, Clarendon Avenue, Distillhouse Street, Eighth Street, Fourth Street, Haskell Street, Hubbard Avenue, Magnolia Avenue, Mill Street, Railroad Street, Third and Otis Streets, Van Norden Street, Willow Street, Worcester Street.

Seventeen (17) service boxes have been reset, and six (6) removed from supplies to be abandoned.

DRINKING FOUNTAINS.

No change in the number of drinking fountains has been made this year. The number in use is twenty-eight (28) — twenty-four (24) of the ordinary style and four (4) ice water drinking fountains of Jenks manufacture.

The ice water drinking fountains were not in use until July ; in the two years preceding they had been in commission about the middle of May.

The Water Board considered that having purchased, set and maintained these ice water fountains for two years it should be relieved of further expense of ice maintenance, and having made and asked for no appropriation for this year's expense, the fountains were not supplied with ice until July as before stated and then at the request of the Mayor.

The bills for this ice have not been settled although an appropriation of four hundred dollars (\$400.00) was asked for and ignored by the City Council. It will be necessary to include this amount in the coming year's estimate.

The fountains located as follows have been repaired :—Central Square, Fresh Pond, Garden Street, Lechmere Square, Inman Square, Norton Square, Porter's Square, Putnam Square.

The supplies for the fountain in Central Square and Garden Street have been renewed.

STREET WATERING STANDPIPES

There has been no work made to the street watering standpipes during 1921.

The general condition appeared the necessity of renewing the valves which were worn and broken. These valves had been caused by the negligence of the men in the Street Department, the cost of repairs was too great to justify the effort.

The standpipes at the corner of Canfield Avenue and Mulberry Street and at the corner of Holly Avenue at the corner of Holly Avenue.

GATES

The cost of the gates was \$1,000.00 and renewal amount as follows:

Gate No. 1 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 2 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 3 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 4 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 5 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

The cost of the gates was \$1,000.00 and renewal amount as follows:

BOXES

The cost of the gates was \$1,000.00 and renewal amount as follows: Gate No. 1 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 2 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 3 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 4 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

Gate No. 5 at the corner of Canfield Avenue and Mulberry Street. The gate was eight feet high, eight feet wide, three feet thick and the cost was \$1,000.00.

The cost of the gates was \$1,000.00 and renewal amount as follows:

(8) lowered to conform to the new surface elevation of the streets as constructed by the Street Department.

Five (5) blow offs and five (5) gate boxes have been reset; one (1) gate box and nine (9) meter boxes have been removed.

HYDRANTS.

Twenty-three (23) hydrants have been added to the list this year: the total number set to date, November 30th, is nine hundred and sixty-eight (968), as follows:—

Boston	159
Chapman	458
Coffin	42
Flush	128
Holyoke	86
Perkins	95
Total	<hr/> 968

Thirty-four (34) post hydrants have been set in the following locations: In Albany Street, east from Pacific, two Chapman; in Baldwin Street, northeast from Cambridge, one Chapman; in Bird Street, near Cushing Avenue, one Chapman; in Cambridge Street, between Fourth and Fifth (Boston removed), one Chapman; in Dana Street, at Broadway, one Chapman; in First Street, at Thorndike, one Boston; in Gorham Street, at Wendell, one Chapman; in Gray Street, at Linnaean (Chapman removed), one Chapman; in Green Street, near Putnam Avenue (Flush removed), one Chapman; in Green Street, southeast from Putnam Avenue, one Chapman; in Green Street, between Lansdowne and Blanche, one Chapman; in Harvey Street, opposite Montgomery (Flush removed), one Perkins; in Magazine Street, at Warland (Flush removed), one Chapman; in Magee Street, east from Putnam Avenue, one Chapman; in Massachusetts Avenue, north and south from Amherst Avenue, two Chapman; in Massachusetts Avenue, north from the Esplanade, two Chapman; in Massachusetts Avenue, corner Linden Street (Boston removed), one Chapman; in Massachusetts Avenue, north and south from Princeton Avenue, two Chapman; in Massachusetts Avenue, south from Vassar, two Chapman; in Massachusetts Avenue, north and south from Wellesley Avenue, two Chapman; in Portland Street, corner Vandine (Boston removed), one Chapman; in Putnam Avenue, southeast from Brookline, one Chapman; in Putnam Avenue, opposite Magee (Boston removed), one Chapman; in Putnam Avenue, northwest from Sidney (Flush removed), one Chapman;

On August 7, Walter Perkins removed, one
from the lot at R. H. Lee Avenue, one Chapman, in
September, from the lot at Wacker Street, near Erie
Street, and Walter Perkins.

1. The first is the *Journal of the Boston Society for the Abolition of Slavery*, published by the Boston Society for the Abolition of Slavery, 1832-1833, 1834-1835, 1836-1837, 1838-1839, 1840-1841, 1842-1843, 1844-1845, 1846-1847, 1848-1849, 1850-1851, 1852-1853, 1854-1855, 1856-1857, 1858-1859, 1860-1861, 1862-1863, 1864-1865, 1866-1867, 1868-1869, 1870-1871, 1872-1873, 1874-1875, 1876-1877, 1878-1879, 1880-1881, 1882-1883, 1884-1885, 1886-1887, 1888-1889, 1890-1891, 1892-1893, 1894-1895, 1896-1897, 1898-1899, 1900-1901, 1902-1903, 1904-1905, 1906-1907, 1908-1909, 1910-1911, 1912-1913, 1914-1915, 1916-1917, 1918-1919, 1920-1921, 1922-1923, 1924-1925, 1926-1927, 1928-1929, 1930-1931, 1932-1933, 1934-1935, 1936-1937, 1938-1939, 1940-1941, 1942-1943, 1944-1945, 1946-1947, 1948-1949, 1950-1951, 1952-1953, 1954-1955, 1956-1957, 1958-1959, 1960-1961, 1962-1963, 1964-1965, 1966-1967, 1968-1969, 1970-1971, 1972-1973, 1974-1975, 1976-1977, 1978-1979, 1980-1981, 1982-1983, 1984-1985, 1986-1987, 1988-1989, 1990-1991, 1992-1993, 1994-1995, 1996-1997, 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013, 2014-2015, 2016-2017, 2018-2019, 2020-2021, 2022-2023, 2024-2025, 2026-2027, 2028-2029, 2030-2031, 2032-2033, 2034-2035, 2036-2037, 2038-2039, 2040-2041, 2042-2043, 2044-2045, 2046-2047, 2048-2049, 2050-2051, 2052-2053, 2054-2055, 2056-2057, 2058-2059, 2060-2061, 2062-2063, 2064-2065, 2066-2067, 2068-2069, 2070-2071, 2072-2073, 2074-2075, 2076-2077, 2078-2079, 2080-2081, 2082-2083, 2084-2085, 2086-2087, 2088-2089, 2090-2091, 2092-2093, 2094-2095, 2096-2097, 2098-2099, 2100-2101, 2102-2103, 2104-2105, 2106-2107, 2108-2109, 2110-2111, 2112-2113, 2114-2115, 2116-2117, 2118-2119, 2120-2121, 2122-2123, 2124-2125, 2126-2127, 2128-2129, 2130-2131, 2132-2133, 2134-2135, 2136-2137, 2138-2139, 2140-2141, 2142-2143, 2144-2145, 2146-2147, 2148-2149, 2150-2151, 2152-2153, 2154-2155, 2156-2157, 2158-2159, 2160-2161, 2162-2163, 2164-2165, 2166-2167, 2168-2169, 2170-2171, 2172-2173, 2174-2175, 2176-2177, 2178-2179, 2180-2181, 2182-2183, 2184-2185, 2186-2187, 2188-2189, 2190-2191, 2192-2193, 2194-2195, 2196-2197, 2198-2199, 2200-2201, 2202-2203, 2204-2205, 2206-2207, 2208-2209, 2210-2211, 2212-2213, 2214-2215, 2216-2217, 2218-2219, 2220-2221, 2222-2223, 2224-2225, 2226-2227, 2228-2229, 2230-2231, 2232-2233, 2234-2235, 2236-2237, 2238-2239, 2240-2241, 2242-2243, 2244-2245, 2246-2247, 2248-2249, 2250-2251, 2252-2253, 2254-2255, 2256-2257, 2258-2259, 2260-2261, 2262-2263, 2264-2265, 2266-2267, 2268-2269, 2270-2271, 2272-2273, 2274-2275, 2276-2277, 2278-2279, 2280-2281, 2282-2283, 2284-2285, 2286-2287, 2288-2289, 2290-2291, 2292-2293, 2294-2295, 2296-2297, 2298-2299, 2300-2301, 2302-2303, 2304-2305, 2306-2307, 2308-2309, 2310-2311, 2312-2313, 2314-2315, 2316-2317, 2318-2319, 2320-2321, 2322-2323, 2324-2325, 2326-2327, 2328-2329, 2330-2331, 2332-2333, 2334-2335, 2336-2337, 2338-2339, 2340-2341, 2342-2343, 2344-2345, 2346-2347, 2348-2349, 2350-2351, 2352-2353, 2354-2355, 2356-2357, 2358-2359, 2360-2361, 2362-2363, 2364-2365, 2366-2367, 2368-2369, 2370-2371, 2372-2373, 2374-2375, 2376-2377, 2378-2379, 2380-2381, 2382-2383, 2384-2385, 2386-2387, 2388-2389, 2390-2391, 2392-2393, 2394-2395, 2396-2397, 2398-2399, 2400-2401, 2402-2403, 2404-2405, 2406-2407, 2408-2409, 2410-2411, 2412-2413, 2414-2415, 2416-2417, 2418-2419, 2420-2421, 2422-2423, 2424-2425, 2426-2427, 2428-2429, 2430-2431, 2432-2433, 2434-2435, 2436-2437, 2438-2439, 2440-2441, 2442-2443, 2444-2445, 2446-2447, 2448-2449, 2450-2451, 2452-2453, 2454-2455, 2456-2457, 2458-2459, 2460-2461, 2462-2463, 2464-2465, 2466-2467, 2468-2469, 2470-2471, 2472-2473, 2474-2475, 2476-2477, 2478-2479, 2480-2481, 2482-2483, 2484-2485, 2486-2487, 2488-2489, 2490-2491, 2492-2493, 2494-2495, 2496-2497, 2498-2499, 2500-2501, 2502-2503, 2504-2505, 2506-2507, 2508-2509, 2510-2511, 2512-2513, 2514-2515, 2516-2517, 2518-2519, 2520-2521, 2522-2523, 2524-2525, 2526-2527, 2528-2529, 2530-2531, 2532-2533, 2534-2535, 2536-2537, 2538-2539, 2540-2541, 2542-2543, 2544-2545, 2546-2547, 2548-2549, 2550-2551, 2552-2553, 2554-2555, 2556-2557, 2558-2559, 2560-2561, 2562-2563, 2564-2565, 2566-2567, 256

[illegible]

... Street, and Fifth to Street, which
... of ... and ...

The 100-ft-long, 10-in.-dia. N. York Street at Van Ness Street has been replaced with a 12-in.-dia. cast-iron pipe. This hydrant is situated in an alleyway between the two buildings and was protected by a stone

44-38861-10

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

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"In order to be successful in the Sauer Heating Company on
a day when the weather was so good, from the inside the inside of the
-24-

1. The first step is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

STONY BROOK.

During the year there have been built on the water shed of this Brook nine (9) vaults and five (5) cess-pools, to take care of house drainage: this makes a total of seventeen (17) vaults and (9) cess-pools already built by the City on this Brook. So far, nearly all of them have been cared for by the City. About twenty-two hundred (2,200) feet of fencing have been built on the Sargent place in Lincoln, and about four hundred (400) feet around the upper part of Stony Brook basin.

I would recommend that an appropriation be made for cleaning this Brook and ditching where it is found that the water is held back by accumulations in the present ditches. The buildings at the dam are in good condition. The gate house roof has been repaired and the brick work pointed where needed.

TABLE SHOWING THE DAILY AVERAGE NUMBER OF GALLONS, BY THE MONTH, FLOWING OVER THE WASTE WAY AT STONY BROOK.

	Gallons.	Number of Days.		Gallons.	Number of Days.
December, 1899....	No overflow.	—	June, 1900....	114,400,000	13
January, 1900....	78,500,000	9	July, 1900....	No overflow.	—
February, 1900....	1,155,200,000	28	August, 1900....	" "	—
March, 1900....	1,687,700,000	31	September, 1900....	" "	—
April, 1900....	568,700,000	30	October, 1900....	" "	—
May, 1900....	815,900,000	31	November, 1900....	28,700,000	3

Total quantity wasted, 4,447,100,000 gallons.

Total number of days in which water wasted 145

STONY BROOK PIPE LINE.

The usual inspection of this line, and the gates, air valves, and blow offs has been made. The discharge through this pipe is now about seven (7) million gallons daily, a decrease of about one and one-half million (1,500,000) gallons since it was laid, thirteen (13) years ago.

I would renew the recommendation made for the past two years that something be done to restore this pipe to its former capacity.

		1900		1901		1902		1903		1904		1905		1906		1907		1908		1909		1910		1911		1912		1913		1914		1915		1916		1917		1918		1919		1920		1921		1922		1923		1924		1925		1926		1927		1928		1929		1930		1931		1932		1933		1934		1935		1936		1937		1938		1939		1940		1941		1942		1943		1944		1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		1956		1957		1958		1959		1960		1961		1962		1963		1964		1965		1966		1967		1968		1969		1970		1971		1972		1973		1974		1975		1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2100		2101		2102		2103		2104		2105		2106		2107		2108		2109		2110		2111		2112		2113		2114		2115		2116		2117		2118		2119		2120		2121		2122		2123		2124		2125		2126		2127		2128		2129		2130		2131		2132		2133		2134		2135		2136		2137		2138		2139		2140		2141		2142		2143		2144		2145		2146		2147		2148		2149		2150		2151		2152		2153		2154		2155		2156		2157		2158		2159		2160		2161		2162		2163		2164		2165		2166		2167		2168		2169		2170		2171		2172		2173		2174		2175		2176		2177		2178		2179		2180		2181		2182		2183		2184		2185		2186		2187		2188		2189		2190		2191		2192		2193		2194		2195		2196		2197		2198		2199		2200		2201		2202		2203		2204		2205		2206		2207		2208		2209		2210		2211		2212		2213		2214		2215		2216		2217		2218		2219		2220		2221		2222		2223		2224		2225		2226		2227		2228		2229		2230		2231		2232		2233		2234		2235		2236		2237		2238		2239		2240		2241		2242		2243		2244		2245		2246		2247		2248		2249		2250		2251		2252		2253		2254		2255		2256		2257		2258		2259		2260		2261		2262		2263		2264		2265		2266		2267		2268		2269		2270		2271		2272		2273		2274		2275		2276		2277		2278		2279		2280		2281		2282		2283		2284		2285		2286		2287		2288		2289		2290		2291		2292		2293		2294		2295		2296		2297		2298		2299		2300		2301		2302		2303		2304		2305		2306		2307		2308		2309		2310		2311		2312		2313		2314		2315		2316		2317		2318		2319		2320		2321		2322		2323		2324		2325		2326		2327		2328		2329		2330		2331		2332		2333		2334		2335		2336		2337		2338		2339		2340		2341		2342		2343		2344		2345		2346		2347		2348		2349		2350		2351		2352		2353		2354		2355		2356		2357		2358		2359		2360		2361		2362		2363		2364		2365		2366		2367		2368		2369		2370		2371		2372		2373		2374		2375		2376		2377		2378		2379		2380		2381		2382		2383		2384		2385		2386		2387		2388		2389		2390		2391		2392		2393		2394		2395		2396		2397		2398		2399		2400		2401		2402		2403		2404		2405		2406		2407		2408		2409		2410		2411		2412		2413		2414		2415		2416		2417		2418		2419		2420		2421		2422		2423		2424		2425		2426		2427		2428		2429		2430		2431		2432		2433		2434		2435		2436		2437		2438		2439		2440		2441		2442		2443		2444		2445		2446		2447		2448		2449		2450		2451		2452		2453		2454		2455		2456		2457		2458		2459		2460		2461		2462		2463		2464		2465		2466		2467		2468		2469		2470		2471		2472		2473		2474		2475		2476		2477		2478		2479		2480		2481		2482		2483		2484		2485		2486		2487		2488		2489		2490		2491		2492		2493		2494		2495		2496		2497		2498		2499		2500		2501		2502		2503		2504		2505		2506		2507		2508		2509		2510		2511		2512		2513		2514		2515		2516		2517		2518		2519		2520		2521		2522		2523		2524		2525		2526		2527		2528		2529		2530		2531		2532		2533		2534		2535		2536		2537		2538		2539		2540		2541		2542		2543		2544		2545		2546		2547		2548		2549		2550		2551		2552		2553		2554		2555		2556		2557		2558		2559		2560		2561		2562		2563		2564		2565		2566		2567		2568		2569		2570		2571		2572		2573		2574		2575		2576		2577		2578		2579		2580		2581		2582		2583		2584		2585		2586		2587		2588		2589		2590		2591		2592		2593		2594		2595		2596		2597		2598		2599		2600		2601		2602		2603		2604		2605		2606		2607		2608		2609		2610		2611		2612		2613		2614		2615		2616		2617		2618		2619		2620		2621		2622		2623		2624		2625		2626		2627		2628		2629		2630		2631		2632		2633		2634		2635		2636		2637		2638		2639		2640		2641		2642		2643		2644		2645		2646		2647		2648		2649		2650		2651		2652		2653		2654		2655		2656		2657		2658		2659		2660		2661		2662		2663		2664		2665		2666		2667		2668		2669		2670		2671		2672		2673		2674		2675		2676		2677		2678		2679		2680		2681		2682		2683		2684		2685		2686		2687		2688		2689		2690		2691		2692		2693		2694		2695		2696		2697		2698		2699		2700		2701		2702		2703		2704		2705		2706		2707		2708		2709		2710		2711		2712		2713		2714		2715		2716		2717		2718		2719		2720		2721		2722		2723		2724		2725		2726		2727		2728		2729		2730		2731		2732		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COMPARATIVE TERMINING FOR THE PAST TEN YEARS

	Concrete	Recessed	Supply	Total Feet	Miles
1	5,000	5,000	17,000	27,000	5.01
2	10,000	10,000	34,000	54,000	9.79
3	15,000	15,000	51,000	81,000	14.68
4	20,000	20,000	68,000	108,000	19.57
5	25,000	25,000	85,000	135,000	24.46
6	30,000	30,000	102,000	162,000	29.35
7	35,000	35,000	119,000	189,000	34.24
8	40,000	40,000	136,000	216,000	39.13
9	45,000	45,000	153,000	243,000	44.02
10	50,000	50,000	170,000	270,000	48.91

From which was found the report of the Chief Engineer of the
 Department of Water Works.

Of which is respectfully submitted.

F. C. BROOKS,

Superintendent

REPORT OF THE PUMPING ENGINEER

CAMBRIDGE, December 1, 1900.

To the Honorable, the Water Board of the City of Cambridge.

GENTLEMEN :—I will again report that the machinery at the Pumping Station is in first class condition.

The Leavitt engine was run up to October 19th, pumping all the water used by the City the past year to this date, when it was shut down for general repairs. The second receiver was changed from tubes to copper coils on account of leaking. The link boxes were re-enforced with composition and scraped to a bearing; the jacket piping was changed to conform to later ideas in regard to reheating, showing good results with a marked increase in duty.

You will find the duty cut down materially the past year on account of stopping the Leavitt engine seventeen days for repairs and seven days for a leak in the force main outside of the Station, making a difference of one hundred thousand pounds of coal in thirty days' run alone, on account of running the No. 1 and No. 2 Worthington engines.

I will again recommend skim coating the No. 1 and No. 2 boilers with magnesia covering, and painting the same, also the steam piping and iron work in the fire-room, to have it compare with the plant in general.

Respectfully submitted,

E. I. HARRIS,
Chief Engineer.

RUNNING EXPENSES AT PUMPING STATION

Electricity	\$10,998.84
Oil	68.45
Grease	33.33
Repairs	12.68
Telephone	479.69
Postage	63.47
Travel	39.15
Supplies	10.50
Insurance	277.50
Depreciation	80.50
Interest	134.00
Income tax	250.00
Profit	105.00
Net income	\$12,544.49
Operating expenses	89.50
Total	\$12,633.99

Annual Report



THE WATER BOARD



City of Cambridge

MASSACHUSETTS



Annual Report



THE WATER BOARD



92
1901
65

City of Cambridge
MASSACHUSETTS



City of Cambridge
Massachusetts

ANNUAL REPORT

OF

THE WATER BOARD

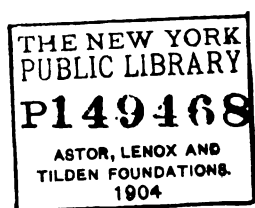
FOR THE

YEAR ENDING NOVEMBER 30, 1901



PRINTED FOR THE DEPARTMENT

[Handwritten signature]



CAMBRIDGE WATER BOARD

1902

President.

WILLIAM B. DURANT

Members of the Board.

THOMAS G. KELLEY	Term expires 1902
EDWIN S. ELLMORE	Term expires 1903
EDWARD STEVENS	Term expires 1904
JOSEPH HOWARD	Term expires 1905
EDWARD D. BENT	Term expires 1906

WALTER H. HARDING, Clerk

Superintendent of Works.

EDWIN C. BROOKS

Water Registrar.

WALTER H. HARDING.

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1865-1901.

CHESTER W. KINGSLEY	1865-1894	
JOHN SARGENT	1865-1871	
A. K. P. WELCH	1865-1871	
ROBERT DOUGLASS	1865-1871	
SAMUEL SLOCOMB	1865-1876	
Z. L. RAYMOND	1871	
HENRY L. EUSTIS	1871-1885	
J. WARREN MERRILL	1871-1881	
GEORGE P. CARTER	1871-1883	
JOHN H. LEIGHTON	1876-1879	
KNOWLTON S. CHAFFEE	1879-1889	
JAMES M. W. HALL	1881-1899	
LEANDER M. HANNUM	{ 1883-1884	
	{ 1885-1893	
JOHN F. O'BRIEN	1884-1895	
GEORGE H. HOWARD	1889-	(Now in Office)
E. BURT PHILLIPS	1893-1896	
STILLMAN F. KELLEY	1894-	(Now in Office)
FRANK A. ALLEN	1895-1899	
WELLINGTON FILLMORE	1896-	(Now in Office)
EDMUND H. STEVENS	1899-	(Now in Office)
WILLIAM B. DURANT	1899-	(Now in Office)

Presidents of the Board.

J. WARREN MERRILL	1865-1867
ERZA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-

REPORT OF THE CAMBRIDGE WATER BOARD

CAMBRIDGE, December 13, 1901.

Whereas, the City Council of the City of Cambridge

has in its seventh annual report of the Cambridge Water Board, for the year ending November 30, 1901, is herewith submitted for your consideration.

No material change has taken place during the year in the quality of the water supplied by the different reservoirs owned by the Board. The previous high standard of quality has been fully maintained, and the quantity supplied to Fresh Pond, by the aqueduct from the Pond, has been adequate to the needs of our present population. It must not be forgotten, however, that during the past two years the annual rainfall has been considerably above the average of previous years.

Constant watchfulness and care are therefore required in order to prevent unnecessary waste, if we would avoid the large expenditure of money which would be involved in the laying of an additional pipe from Stony Brook.

All the reservoirs of the system, with their surroundings, are in good water and in excellent sanitary condition, and the buildings, pumping station and engines are in good order and repair, and fully up to the standard of previous years.

FINANCIAL STATEMENT IN BRIEF

The total cost of the Water Works to November 30, 1901, was	\$1,670,739 32
There was expended during the year on construction account	21,798 71
Thus the total cost to November 30, 1902, was	\$1,692,538 03

WATER BOARD ACCOUNT

The gross amount of bonds outstanding is	\$1,300,000 00
deducting from this sum the present value of the Water Debt	
standing Fund, exclusive of the note of the City for \$200,000	757,721 34
leaves as net Water Debt	\$2,374,259 03

For further details of the financial condition of the department will be found in the statement of the Registrar annexed to this report. From that statement it will appear that the excess of receipts over expenditures during the past year is the sum of

\$2,600 00

During the year the old reservoir, with the land appurtenant to the same, on Highland Street has been surrendered to the heirs of Charles C. Little, according to the condition of the original deed, which provided that in case of disuse the same should revert to said heirs, and the small strips of land adjoining the same, which the City owned absolutely, have been sold to said heirs, and the proceeds of the surrender and sale, namely \$13,278.67 paid into the Water Works Sinking Fund, all by vote of the City Council.

Previous to the surrender and sale, all the pipes and fittings were disconnected, and the ends of the pipes plugged, so that no connection with the old reservoir now exists.

FRESH POND.

In accordance with the recommendation of the Water Board, an appropriation was made by the City Council in March, last, of the sum of \$12,000, out of the surplus receipts of the Water Works, for the purpose of completing a portion of the unfinished work around Fresh Pond. Eleven thousand five hundred dollars of this sum have been expended, under the direction of the Superintendent, in grading and resurfacing a large area of rough and uneven land, on the west side of the Pond adjoining Huron Avenue and near Concord Avenue.

This improvement is very marked, and has called forth many favorable comments from citizens who have had occasion to visit the locality; and, in the opinion of the Board, the money has been well invested. Other places around the Pond are still in need of improvement, and the Board earnestly recommends that the City Council make a further appropriation for the same purpose, for the coming municipal year.

Complaint has been made to the Board, that motor vehicles frequently resort to the driveway around the Pond, to the danger and discomfort of persons who ride and drive thereon, owing to their horses taking fright at the sight of such vehicles.

The Board suggest to the City Council, the passage of an ordinance prohibiting the use of the driveway by motor-vehicles.

On account of the sharp curves in the roadway, such vehicles are much more dangerous there than in any other places, and, as the public parks are for the benefit of all the citizens, the pleasure of a few should

not be allowed to imperil the safety of the vast majority of visitors who cannot be said to ride in motor vehicles.

WATER RISING

On the first day of December, 1900, the water in Hobbs Brook Reservoir was three feet and seven tenths (.37) below high water mark. Stony Brook was overflowing the dam, and Fresh Pond was about two feet above high water mark. On the first day of December, 1901, the water in Hobbs Brook Reservoir was one foot and nine inches below high water mark. Stony Brook was overflowing the dam, and the water in Fresh Pond was about two feet below high water mark, as it was a dry day. The reservoir at Stony Brook dam, which has necessarily run very low since Charles River, for the year ending November 30, 1901, contained

6,141,000,000 gallons

The same for the previous year was

4,447,000,000 "

Being a gain of this year of

1,694,000,000 gallons

The amount for the past year is more than two years' supply, based on an assumed amount of consumption.

RAIN FALL

The average rain fall for the year at Hobbs Brook was 44.72 inches, at Stony Brook 46.77 inches, and at Fresh Pond 46.20 inches.

The average rainfall at Fresh Pond during the last ten years is as follows:

1891	44.85
1892	40.49
1893	53.85
1894	47.12
1895	38.82
1896	42.51
1897	52.42
1898	47.28
1899	46.89
1900	46.20
Average	44.25

The rainfall of the last two years has been well above the average, and the foregoing table would seem to indicate the probability of a dry season ~~in 1902 or 1903~~ 1902 or 1903.

WATER BOARD.

CONSUMPTION OF WATER.

The total consumption of water for the year ending December 1, 1901, was	2,785,156,440 gallons.
During the year ending December 1, 1900, the total consumption was	<u>2,651,277,240</u> "
An increase of	133,879,200 gallons.

During the past year, the pressure of water in the City has been increased about ten pounds, by the adjustment of the regulator valves in the forty-inch distributing main, and this increase of pressure has necessarily increased the total consumption; each opened faucet delivering more water in the same time, and each leak in main or service pipe contributing a larger item of waste. Consequently the above figures are not as favorable as those of the preceding year.

The consumption of the year 1899 however was	2,882,570,430 gallons
So that the consumption of 1901, namely	<u>2,785,156,440</u> "
was not so large as that of 1899 by	97,413,990 gallons.

WATER METERS.

The total number of meters now in use is one thousand eight hundred ninety-eight (1,898), of which one thousand seventy (1,070) were set this year, in accordance with the vote of the City Council, appropriating the sum of \$10,000 for the purpose of extension of the meter system. The Board earnestly recommend the appropriation of a similar or larger sum for the ensuing year, for the reasons already given in the last annual report. Many water-takers prefer to have water meters attached to their supplies, and have petitioned the Board to that effect, and, so far as they were able, the Board have invariably granted the requests of these water-takers. Unless, however, a suitable appropriation shall be made, the Board will be compelled to disappoint a great many applicants, as they have in several cases been obliged to do heretofore, for want of a sufficient number of meters. The system seems to be growing in favor with the water-takers, especially since the City Council, on the recommendation of the Board, during the past year, reduced the minimum rate for metered water to five dollars, thus making it possible for economical consumers of water to make a considerable saving in the amount of their water bills, which they could not do under the former minimum rate of fifteen dollars.

No more evidence on every hand that the meter system is constantly increasing in popularity. In view of the fact that the general use of meters is recommended by the Chief Engineer of the Metropolitan Board, and that the Water Boards of the different cities of the Commonwealth who have adopted a meter system, in whole or in part, unanimously favor that method of distributing water, it is probable that, within a few years, every city in the Commonwealth, including those embraced in the Metropolitan Board, will have adopted the system, either as a matter of necessity, to conserve water, or as a matter of choice, in order to distribute equitably among the water takers the burden of the expense of maintenance.

Respectfully submitted,

WILLIAM B. DURANT,	
GEORGE H. HOWARD,	<i>Cambridge</i>
STILLMAN F. KELLEY,	<i>Water</i>
WELLINGTON FILLMORE,	<i>Board.</i>
EDMUND H. STEVENS,	

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 5, 1901.

To the Cambridge Water Board:—

GENTLEMEN:—In compliance with the requirements of the City Ordinance I present the thirty-seventh annual report of the operations of this department showing the receipts, expenditures and abatements together with a statement of the number of water takers, etc., for the year ending November 30, 1901.

Amount of bills remaining unpaid November 30, 1900 :—

Water rates	\$141 55
Meter rates	59 00
Supplies and repairs	561 71
Off and on	134 00
Seals	6 25
Maintenance account	726 30
Construction account	76 38

Amount of bills placed in hands of City Treasurer for collection from November 30, 1900, to November 30, 1901 :—

Water rates	\$216,596 84
Meter rates	110,174 36
Supplies and repairs	5,698 88
Off and on	649 00
Rents	168 00
Seals	153 00
Maintenance account	2,228 99
Construction account	15 01
Total bills	<u>\$337,389 21</u>

There has been collected —

Water rates	\$213,493 04
Meter rates	109,380 25
Supplies and repairs	5,253 08
Off and on	628 00
Rents	168 00
Seals	146 00
Maintenance account	2,561 38
Construction account	15 01

WATER REGISTRY

13

There has been added

1 our share of and on and water, supplies and repairs, and
 construction account 03,793 75

There remains accumulated

Water share	074 03
Water share	340 79
Supplies and repairs	1 016 81
Water share	114 00
Water	4 00
Construction account	391 91
	0317,849 37

EXPENDITURES

Construction account	012 176 71
Construction account	79,239 14
	0111 417 89

DEBITMENTS

Water share to the amount of	03,214 37
Water share to the amount of	3 01
Water share to the amount of	74 34
	03,291 75

RECEIPTS

Water share to the amount of	02 041 74
Water share deducted from receipts	372 073 79
Water share to the amount of	391 464 01
Water share to the amount of	3 341 34
	0371 271 29

OFF AND ON

There has been shut off for non-payment of rates, or per order on
 and rates have been applied to rates in respect of
 water share

Water share off in 1901	701
Water share off in 1901	179
Water share off in previous years	100
Water share off	173
Water share off in 1901	661
Water share off in 1901	467
Water share off in previous years	179

Statement of yearly revenue received from water rates since the purchase of the works by the City :—

From April 28, 1865, to December 1, 1865	£32,367 19
From December 1, 1865, to December 1, 1866	40,073 27
From December 1, 1866, to December 1, 1867	53,733 62
From December 1, 1867, to December 1, 1868	63,747 42
From December 1, 1868, to December 1, 1869	76,149 30
From December 1, 1869, to December 1, 1870	92,605 95
From December 1, 1870, to December 1, 1871	111,782 65
From December 1, 1871, to December 1, 1872	127,201 30
From December 1, 1872, to December 1, 1873	146,117 32
From December 1, 1873, to December 1, 1874	153,634 27
From December 1, 1874, to December 1, 1875	138,880 37
From December 1, 1875, to December 1, 1876	179,166 76
From December 1, 1876, to December 1, 1877	154,843 59
From December 1, 1877, to December 1, 1878	157,443 91
From December 1, 1878, to December 1, 1879	164,681 90
From December 1, 1879, to December 1, 1880	173,325 49
From December 1, 1880, to December 1, 1881	170,062 73
From December 1, 1881, to December 1, 1882	177,430 80
From December 1, 1882, to December 1, 1883	179,361 89
From December 1, 1883, to December 1, 1884	161,526 27
From December 1, 1884, to December 1, 1885	185,544 36
From December 1, 1885, to December 1, 1886	199,404 43
From December 1, 1886, to December 1, 1887	204,748 64
From December 1, 1887, to December 1, 1888	211,156 27
From December 1, 1888, to December 1, 1889	231,124 70
From December 1, 1889, to December 1, 1890	231,116 32
From December 1, 1890, to December 1, 1891	227,054 53
From December 1, 1891, to December 1, 1892	237,527 08
From December 1, 1892, to December 1, 1893	242,219 78
From December 1, 1893, to December 1, 1894	250,032 71
From December 1, 1894, to December 1, 1895	268,813 62
From December 1, 1895, to December 1, 1896	281,030 00
From December 1, 1896, to December 1, 1897	291,457 62
From December 1, 1897, to December 1, 1898	297,129 78
From December 1, 1898, to December 1, 1899	302,569 00
From December 1, 1899, to December 1, 1900	319,479 37
From December 1, 1900, to December 1, 1901	320,468 01

COMPARATIVE STATEMENTS

[illegible]

COMPARATIVE STATEMENT.—*Continued.*

	1900		1901	
Maintenance account, excess of receipts.....	\$14,687 59			
Supply account, excess of expenditures.....	335 48			
Excess of total receipts over total expenditures.....		\$14,332 11		
Maintenance account, excess of receipts.....				\$2,649 05

The excess of receipts shown above, amounting to \$2,649.05 has been carried to the sinking fund as required by law.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 19,630 families, 751 stables, 2,481 horses, 131 cows, 263 shops, and 594 offices and stores, by the following fixtures, viz:—

23,136 faucets,
8,760 wash basins,
12,056 wash tubs,
7,840 bath tubs,
258 slop closets,
20,047 pan closets,
4 hopper closets,

52 urinals,
10 yard hydrants,
5 fountains,
28 tumbler washers,
2,068 hand hose,
17 motors.

Also,

978 fire hydrants (beside 19 on private premises).
8 fire reservoirs.
28 drinking fountains in public squares.
59 street watering standpipes.
4 public sanitarries.

The above schedule of fixtures does not include those in schoolhouses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made with very satisfactory results.

Respectfully submitted,

WALTER H. HARDING,
Registrar.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1901

Water bills unpaid November 30, 1901	\$240 33
Water bills unpaid November 30, 1900	361 71
Water bills unpaid November 30, 1900	134 00
Water bills unpaid November 30, 1900	4 25
Water bills unpaid November 30, 1900	226 30
Water bills unpaid November 30, 1900	74 30
	<u>\$1,706 19</u>

Statement of the Rates of the City
from December 1, 1900 to December 1, 1901

Water rates from annual meters	\$210,702 00
Water rates from fractional meters	5,024 04
Water rates from meter meters	110,174 26
Water rates from meter meters	649 00
Water rates from meter meters	153 00
Water rates from meter meters	166 00
Water rates from meter meters	5,024 04
Water rates from meter meters	2,224 00
Water rates from meter meters	15 01
Water rates from meter meters	1,530 00
	<u>\$317,214 00</u>
Total bills	<u>\$118,919 27</u>

Statement of the Rates of the City

Water rates from annual meters	\$210,702 00
Water rates from fractional meters	5,024 04
Water rates from meter meters	110,174 26
Water rates from meter meters	649 00
Water rates from meter meters	153 00
Water rates from meter meters	166 00
Water rates from meter meters	5,024 04
Water rates from meter meters	2,224 00
Water rates from meter meters	15 01
Water rates from meter meters	1,530 00
	<u>\$317,214 00</u>

Statement of the Rates of the City

Water rates from annual meters	\$210,702 00
--------------------------------	--------------

STATEMENT OF THE WATER REGISTRAR.

There remains uncollected:—

Water rates	\$428 34	
Supplies and repairs	1,004 51	
Off and on	118 00	
Seals	6 00	
Maintenance account	393 91	
	<u>5,744 51</u>	
Total bills for collection		\$338,919 27
Less abated	\$3,793 75	
Less refunded	2,405 28	
Less unpaid	<u>1,950 76</u>	
		<u>\$8,149 79</u>
Net receipts		\$330,769 48

Attest:

WALTER H. HARDING,
Registrar.

CAMBRIDGE, December 10, 1901.

I have examined the accounts of the Water Registrar and find that they correspond in the amounts collected, abated, refunded and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor.

STILLMAN F. KELLEY,
Committee on Accounts.

CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER,

December 2, 1901

SIR:—*Re New Water Board.*

I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1901.

Amounts received for account of Water Works, "Water Rates,"	
Maintenance and Supply Accounts	\$335,347 12
Construction Accounts also received and paid on "Water Rates"	3,793 75
Balance on Vouchers have been presented and paid to amount of	2,405 20
Amounts paid to date November 30, 1901, for account of	
"Water Rates," Maintenance and Supply Accounts	1,980 74
Amounts paid to date November 30, 1901, for account of Water Works, Construction	1,621 20

Very respectfully,

WM. W. DALLINGER,

City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM

City Auditor.

REPORT OF THE SUPERINTENDENT OF WATER WORKS

CAMBRIDGE, December 2, 1901.

To the Honorable Water Board of the City of Cambridge :

GENTLEMEN:—Complying with the City Ordinance, I herewith submit the twenty-seventh annual report of the Superintendent, for the year ending November 30, 1901.

CONSUMPTION.

	Gallons.
Total quantity of water consumed during the past year	2,745,156,440
Daily average water consumed during the past year	7,520,976
Quantity of water sold by meter	785,936,760
Quantity of water used for sprinkling streets	79,738,425
Quantity of water used for flushing sewers	1,250,000
Quantity of water used for cleaning sanitaries	7,500,000
Quantity of water used for drinking fountains	35,000,000
Quantity of water used for testing meters	113,595
Total	909,538,780
Leaving for domestic purposes	1,835,617,660

Number of gallons daily for each inhabitant on the total amount consumed, 80.87.

Number of gallons daily for each inhabitant on the total amount used for domestic purposes, including water for private stables, hose, public buildings and fire purposes, 54.07.

COMPARATIVE STATEMENT OF TOTAL PUMPING DURING THE PAST TEN YEARS.

Date.	Total Yearly Pumping.	Increase or Decrease.	Average Daily Pumping.	Increase or Decrease	Gallons to each inhabitant daily.
1892	1,961,362,760	183,305,987 increase	5,358,915	487,527 increase	66.00
1893	2,234,863,924	273,501,164 "	6,122,915	764,000 "	74.50
1894	2,127,878,627	106,985,297 decrease	5,829,804	293,111 decrease	69.19
1895	2,190,781,892	62,903,265 increase	6,002,142	172,338 increase	71.65
1896	2,413,506,557	222,724,665 "	6,594,280	592,136 "	75.90
1897	2,441,340,196	27,833,639 "	6,688,603	94,323 "	76.46
1898	2,792,321,110	350,980,914 "	7,650,195	961,592 "	86.00
1899	2,882,570,430	90,249,320 "	7,897,453	247,258 "	87.16
1900	2,651,277,240	231,293,190 decrease	7,263,773	633,680 decrease	78.00
1901	2,785,156,440	133,879,200 increase	7,630,566	366,793 increase	80.87

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T E N Y E A R S

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FRESH POND AND SURROUNDINGS.

The care of the grounds and roads about the pond and the propagation and care of the plants and shrubs in the nursery has continued as in past years.

On September 3rd, work was begun on continuing the grading on the west side of the Pond, from the point where it was left three years ago towards Concord Avenue. Nearly seven acres have been graded and planted, adding very much to the appearance of that part of the grounds. The work was continued until November 30th and comparatively little more remains to be done to complete that portion of the work.

The plants on the previously graded sections have made good growth and have added very much to the attractiveness of this section the past season.

The sales from the nursery the past year have amounted to eight hundred eighty dollars and forty-two cents (\$880.42). All standing grass not needed by the department has been sold.

The average height of the Pond for the past year has been 15.69 feet.

A larger amount of the weeding of the shallow portions of the Pond than usual, has been necessary this year.

Two catch basins have been constructed on Huron Avenue and two near the end of Holworthy Street to prevent the wash from the streets running into the Pond.

FROM POND RESERVOIR

No.	Name of Pond	Area of Pond in Acres	Depth of Pond in Feet	Volume of Water in Cubic Feet	INTAKE RATE			
					From Opening		From Opening	
					Open	Close	Open	Close
1	1st Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	2nd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3	3rd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4	4th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	5th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
6	6th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
7	7th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	8th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
9	9th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	10th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
11	11th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	12th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
13	13th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	14th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
15	15th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	16th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
17	17th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
18	18th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
19	19th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	20th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
21	21st Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
22	22nd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
23	23rd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24	24th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	25th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26	26th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
27	27th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
28	28th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
29	29th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30	30th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
31	31st Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
32	32nd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
33	33rd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
34	34th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
35	35th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
36	36th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
37	37th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
38	38th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
39	39th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
40	40th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
41	41st Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
42	42nd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
43	43rd Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
44	44th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
45	45th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
46	46th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
47	47th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
48	48th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
49	49th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00
50	50th Pond	1.00	1.00	1.00	1.00	1.00	1.00	1.00

PUMPING STATION AND GROUNDS

The pumping station and grounds have been under the past year and have done well. The water is of good quality and the pump is in good order. The water is of good quality and the pump is in good order. The water is of good quality and the pump is in good order.

HIGHLAND STREET RESERVOIR

The Highland Street Reservoir is a small reservoir and has been under the past year and has done well. The water is of good quality and the pump is in good order. The water is of good quality and the pump is in good order. The water is of good quality and the pump is in good order.

PAYSON PARK RESERVOIR.

The north basin of this reservoir was cleaned out early this season and a check valve placed on the mud pipe leading to the main drain. A short length of four-inch drain was laid along the foot of the slopes on the south-east corner of the south basin to carry off water that appeared to be coming through the ground.

The roadway from Common Street to Elm Street has been graded and put in good condition by the Payson Park Land Company. The sidewalks about the reservoir grounds should be graded and properly surfaced.

The buildings and the reservoir grounds are in first-class condition.

The leakage from the basin continues about the same as at the last report.

PIPE YARD.

The buildings at the yard are in need of painting and a new fence should be built along the Auburn Street side.

HIGH SERVICE.

On September 9th the pressure on the City mains was increased by the adjustment of the regulator valves so that the highest buildings on Dana Hill could be supplied from the low service, and on the 23rd of the same month the gates and check valves were opened and the high service since that date has supplied only that portion of the high land situated on the following streets:—

Agassiz Street.
Appleton Street, from Highland Street
to beyond Hutchinson Street.
Arlington Street.
Avon Hill Street.
Bates Street.
Bellevue Avenue.
Bellevue Avenue, west.
Buena Vista Park.
Garden Street, from Huron Avenue to
Linnaean Street.
Highland Street, from Reservoir Street
to Appleton Street.
Hillside Avenue.
Holly Avenue.
Humboldt Street.

Huron Avenue, from Appleton Street
to Raymond Street.
Lancaster Street.
Linnaean Street.
Mount Pleasant Street.
Mount Vernon Street.
Raymond Street, from Linnaean Street
to Walden Street.
Reservoir Street, from Highland Street.
Upland Road, from Richdale Avenue
to Huron Avenue.
Vassal Lane, from Huron Avenue.
Vincent Street.
Walnut Avenue.
Washington Avenue.

LIST OF CHECK VALVES IN USE.

Union Street at Hutchinson Street

Union Street and Linnæan Street

Union Street and Linnæan Street

Market Avenue Street, one hundred feet west from Massachusetts Avenue

Union Street and Linnæan Street

Union Street at Walden Street

LEAKAGE.

Twenty-two hundred and twenty-two leaks have been repaired during the year. They were discovered as follows:

One hundred forty-two 1½" on supplies in street

One hundred thirty-six mains (See Stony Brook Pipe Line for details of this leak)

One hundred twenty-four inch mains

One hundred twenty inch mains

One hundred twenty inch pumping mains

Three hundred and thirty hydrants

Fourteen 14" on valves and mains

One hundred forty inch mains

One hundred thirty inch mains

One hundred thirty inch hydrants

One hundred thirty inch gates

One hundred thirty inch hydrants

One hundred thirty inch street watering hydrants

One hundred thirty inch hydrants

One hundred and eighty-three 1000 on premises

One hundred and eighty-three 1000 were discovered by inspectors while making the annual canvass. They were reported as follows:

One hundred and eighty-three 1000 on water closets

Three hundred and seventy-nine 1000 on fountains

One hundred and thirty on basins

Twenty-eight (28) on pipes.

Twenty-one (21) on tanks.

Fifteen (15) on stop and waste valves.

Eleven (11) on bath tubs.

Six (6) on wash trays.

Three (3) on sill cocks.

Ten (10) leaks on supplies in the street have been caused by electrolysis. The cost of repairs, one hundred sixty-nine dollars and seventy-four cents (\$169.74) has been charged to the Boston Elevated Railway Company.

TABLE SHOWING A GAIN OR LOSS IN TOTAL CONSUMPTION FOR THE YEAR 1901 OVER THE YEAR 1900.

	Total Consump- tion 1901.	Total Consump- tion 1900.	Increase or Decrease, + or -.
December.....	220,410,520	204,553,360	+15,857,160
January.....	239,847,080	243,173,920	-3,326,840
February.....	235,592,720	199,942,120	+35,650,600
March.....	222,808,960	229,569,060	-6,760,100
April.....	208,336,800	201,539,860	+6,796,940
May.....	207,740,720	196,051,120	+11,689,600
June.....	236,636,840	225,405,400	+11,231,440
July.....	255,524,280	274,256,400	-18,732,120
August.....	246,125,000	226,855,640	+19,269,360
September.....	231,464,200	224,104,760	+7,359,440
October.....	250,991,840	224,248,580	+26,743,260
November.....	229,687,480	202,584,500	+27,102,980
Total.....	2,785,156,440	2,651,277,240	133,879,200

MAIN PIPE.

Nine thousand eight hundred seventy-six (9,876) feet of main pipe have been laid during the year; of the above amount four thousand one hundred twenty-six (4,126) feet were for extension and five thousand seven hundred fifty (5,750) feet were for renewal. The sizes were from two-inch to twelve-inch.

In Ellery Street from Broadway to Cambridge Street a new eight-inch main has been laid to replace the old four-inch laid in 1867, and six-inch laid in 1869.

In Eighth Street from Spring Street the laying of the new six-inch main pipe does away with the old three-inch laid in 1867.

MAIN PIPE LAID, NUMBERS OF GATES AND FIRE HYDRANTS.—Continued.

	IRON PIPE.		GATES.		HYDRANTS.	
	Length	Size.	No.	Size.	No.	Kind.
Elgth St., at Spring.....			1	6		
Ellsworth Ave., at Broadway.....					1	Chapman.
Front St., from Winsor to Mass. Ave.....	181	4				
" at Winsor.....			1	4		
Grant St., corner DeWolf.....					1	Chapman.
Garden St., from Bond to Concord Ave.....	1,284	8				
" at Bond.....			1	8		
" at Chauncy.....	10	6				
" at Shepard.....	10	6			1	Chapman.
Granite St., from Magazine.....	257	4				
" at Magazine.....			1	4		
" from Pearl to Brookline.....	575	6				
" at Rockingham.....	6	6			1	Chapman.
Gorham St., at Hammond.....	38	6			1	Chapman.
Highland St., at Appleton.....	5	10	1	10		
Highland St.....	8	12				
Jefferson St., corner Harding.....					1	Flush.
Kirkland St., and Kirkland Pl.....			1	4		
Locust Court from Cushing.....	107	2				
Locust St., at Cushing.....			1	6		
Longfellow Park from Brattle.....	228	4				
" at Brattle.....			1	4		
Marcella St., from Berkshire to Portland.....	328	6				
" at Berkshire.....			1	6		
" at Portland.....			1	6		
Mass. Ave at Beech.....	10	6			1	Chapman.
" from Quincy Sq to Trowbridge.....	1,112	10				
" near Arrow.....	33	6			1	Chapman.
" at Remington.....			1	10		
" near Quincy.....	10	6			1	Chapman.
Murdock St., at Hampshire.....			1	4		
Norris St.....					1	Chapman.
Norumbega St., from Belmont.....	208	6				
" at Belmont.....			1	6		
" at Belmont.....	6	6			1	Chapman.
Oxford St., at Kirkland.....			1	6		
Osborn St., corner Main.....			1	6	1	Chapman.
Pearl St.....	13	6				
Plympton St., from Mt. Auburn to Bow.....	41	6				
" at Mt. Auburn.....			1	6		
" at Bow.....	6	6			1	Chapman.
Putnam Sq., at Mass. Ave.....	24	10				
Quincy St., from Broadway.....	468	6				
" at Broadway.....	6	6			1	Chapman.
Remington St., at Mass. Ave.....	10	6				
" 155 ft. from Harvard.....	6	6			1	Chapman.
Rice St., 540 ft. from Mass. Ave.....					1	Flush.
Rockingham St., at Henry.....			1	4		
" at Granite.....	12	4	1	4		
Sparks St., at Brewster.....	7	6			1	Chapman.
" at Huron Ave.....	87	6				
" at Huron A.....			1	6		
" from Brattle.....	640	6				
Walker St., from Garden to Shepard.....	844	6				
" at Garden.....	16	6	1	6		
" at No. 35.....	6	6			1	Chapman.
Western Ave., at Putnam Ave.....					1	Flush.
Ware St., from Broadway.....	364	6				
Walden St., at Wood.....	8	6			1	Chapman.
Waverly St.....					1	Comm.
Whittemore Ave., from Madison Ave.....	293	6				
Yorktown St., from Mass. Ave.....	499	6				
" at Mass. Ave.....			1	6		

max. depths and weights of cast iron pipe laid are as follows:

	Length in Feet	Weight in Pounds
h	0	31
h	100	20
h	100	20
h	100	11
h	100	11

and that the regular annual house-to-house inspection and of repairs of the street watering standpipes and service boxes, a new standpipe and service box has been made under the direction of Engineer Herbert Parker, and the main pipes in the entire City have been fixed. It was necessary to do this during the night in order to keep with the day's demands.

SI FILLES

1. The total 2012 supplies have been laid during the year for 2012-13. The supplies are heretofore not connected directly with the

has been reported to date fourteen thousand four hundred and thirty five.

...the ... of new supplies will be ... and ...
... the ... of

1000 copies have been for sale at the
\$1.00 per copy.

There are thirty (30) supplies have been returned. The
the following: 1. Mr. Adams Street and Bridge Street to the
quantity of the Water Department examined and returned to the
2. Mr. Adams Street to the 1st St. and Bridge Street
3. Mr. Adams Street to the 1st St. and Bridge Street
4. Mr. Adams Street to the 1st St. and Bridge Street
5. Mr. Adams Street to the 1st St. and Bridge Street
6. Mr. Adams Street to the 1st St. and Bridge Street
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26. Mr. Adams Street to the 1st St. and Bridge Street
27. Mr. Adams Street to the 1st St. and Bridge Street
28. Mr. Adams Street to the 1st St. and Bridge Street
29. Mr. Adams Street to the 1st St. and Bridge Street
30. Mr. Adams Street to the 1st St. and Bridge Street

name of the law firm is written in the bottom right.

Belmont Street, Bolton Street, Erie Street, Eustis Street, Hampsh Street, Harris Street, Montgomery Street and Sherman Street.

The temporary supplies laid for the use of the Sewer Department its construction of sewers have been removed.

All the supplies in Mt. Auburn Street are now fed from the two four inch, the old four-inch having been abandoned.

In Prison Point Street all the old pipes which have formerly supplied the Boston & Maine Railroad Company have been removed.

In Clark Street from School Street to Washington Street the supplies have been moved to conform to the changes in the street lines.

Following is the list of establishments having fire protection from the City of Cambridge:—

American Rubber Co.,	Binney street,	Two 6-in.
American Net & Twine Co.,	Third street,	6-in.
Barber Asphalt Paving Co.,	First street,	6-in.
Bay State Metal Works,	Harvard street,	6-in.
Blacker & Shepard,	Osborn street,	2-in.
Blake, Geo. F., Manufacturing Co.,	Third street,	4-in.
Boston Book Binding Co.,	Mt. Auburn street,	6-in. & 4-in.
Boston Elevated Railway Co.,	Baldwin street,	2-in. & 4-in.
" " " "	Cambridge street,	Two 2-in.
" " " "	Pelham street,	3-4-in.
" " " "	Massachusetts ave.,	4-in.
" " " "	Mt. Auburn street,	2-in. & 4-in.
" " " "	Murray street,	4-in.
" " " "	River street,	4-in.
Boston & Maine Railroad Co.,	Bridge street,	4-in.
" " " "	Bridge street,	6-in.
" " " "	Prison Point street,	4-in.
Boston Woven Hose & Rubber Co.,	Portland street,	10-in. & 8-in.
Cambridge Gas Co.,	Third street,	6-in.
Cambridge Mutual Fire Insurance Co.,	Massachusetts ave.,	2-in.
Chelmsford Foundry Co.,	Portland street,	2-in.
Davis, Curtis & Co.,	Broadway,	6-in.
Davis, James C. & Co.,	Broadway,	4-in. & 6-in.
Dover Stamping Co.,	Pleasant street,	6-in.
Dow, John C. & Co.,	Portland street,	2-in.
Forgarty & Daly,	Massachusetts ave.,	4-in.
Ginn & Co.,	First street,	Two 6-in.
" " " "	Athenæum street,	One 8-in.
Goepper Bros.,	Ninth street,	1 1-2-in.
Harvard College,	H'v'rd Union, Harvard st.,	4-in.
" " " "	Memorial Hall, Camb. st.,	4-in.
" " " "	Observatory, Concord ave.,	1-in.
" " " "	Semitic Mus., Divinity ave.,	4-in.
Holy Ghost Hospital for Incurables,	Hovey avenue,	3-in.
Houghton, Mifflin & Co.,	Albro & Blackstone sts.,	6-in.
" " " "	River street,	6-in.

Irving & Casson,	Otis street,	6-in.
" "	Thorndike street,	6-in.
" "	Thorndike street,	2-in.
Ivers & Pond Piano Co.,	Albany street,	4-in.
Jones, C. L. & Co.,	Pearl street,	4-in.
Keeler & Co.,	Thorndike street,	1-in.
Kendall, Edward, & Sons,	Main street,	2-in.
Lamb & Ritchie,	Albany street,	6-in.
Laminar Fibre Co.,	Tannery street,	2-in.
Liquid Air, Power & Automobile Co.,	Albany street,	4-in.
Lockhart, William L.,	Bridge street,	1 1-2-in.
Luke, E. H., Est. of,	Main street,	2-in.
Mason & Hamlin Co.,	Broadway,	Two 6-in.
Massachusetts Athletic Association,	Lansdowne street,	4-in.
Met. Storage Warehouse Co.,	Massachusetts ave.,	6-in.
Middlesex Co'y, House of Correction,	Second & Spring streets,	6-in.
National Biscuit Co.,	Franklin street,	4-in.
" " "	Green street,	8-in.
National Linseed Oil Co.,	Fifth street,	6-in.
North Packing & Provision Co.,	Winter street,	6-in.
O'Brien, John (Rev.)	Seventh street,	4-in.
Page, George G., Box Co.,	Hampshire street,	6-in. & 4-in.
Petterson, Oscar G.,	483 Main street,	4-in.
Pi Eta Club,	Winthrop street,	2-in.
Porter, Henry S.,	Kinnaird street,	4-in.
Reardon, John, & Sons, Corporation,	Waverly street,	4-in.
Revere Sugar Refinery,	Water street,	6-in.
Reversible Collar Co.,	Putnam avenue,	6-in.
Russell, Lucy J.,	29 Elm street,	1 1-2-in.
Sawyer, Howard M., & Son,	Thorndike street,	4-in.
Seavey Manufacturing Co.,	Third street,	6-in.
Seelye Manufacturing Co.,	First street,	4-in.
Simplex Electrical Co.,	Auburn street,	3-in.
" " "	Auburn street,	6-in.
" " "	Franklin street,	6-in.
Slavens, Luther R.,	Broadway,	2-in.
Smart, Charles E.,	Main street,	2-in.
Sparrow, H. F., & Co.,	Hampshire street,	6-in.
Speare's, Alden, Sons & Co.,	Rogers street,	4-in.
" " " "	Sixth street,	4-in.
Standard Oil Co.,	Potter street,	6-in.
Thayer, Henry, & Co.,	Broadway,	6-in.
Tower, Sylvester, & Son,	Broadway,	4-in.
University Associates,	Linden street,	4-in.
University Press,	Nutting Place,	6-in.
Wetmore, C. D.,	Claverly Hall, Mt. Auburn st.,	4-in.

DRINKING FOUNTAINS.

There are twenty-eight (28) drinking fountains in use; four (4) of these are ice water drinking fountains of Jenk's manufacture.

These ice water drinking fountains were supplied with ice from June 13th to October 1st at a cost of four hundred forty-seven dollars and eleven cents (\$447.11).

This date (June 13th) is one month later than usual but as there had been no appropriation made for this expenditure the Water Board did not feel authorized to incur the expense until June, when the City Council made an appropriation for five hundred dollars (\$500.00).

The fountains in the locations following have been repaired: Brookline Street at Putnam Avenue, Central Square, Kendall Square, Massachusetts Avenue and Peabody Street.

STREET WATERING STANDPIPES.

No addition has been made during the year to the number of standpipes; there are fifty-nine (59) in use.

When the standpipes were put into commission in the spring the cost of repairs on valves made necessary by exposure to frost was met by the Street Department, it being considered responsible for the negligence of its drivers.

The standpipes have been removed from Cambridge Street at Oak Street and set on Cambridge Street near Inman Square and from Henry Street at Brookline Street and set on Henry Street about one hundred fifty-five (155) feet from Brookline Street.

Outside of the annual inspection and repair of street watering standpipes, the standpipes in the following locations have received additional repairs: Broadway and Sixth, Broadway and Third, Prison Point Street, Putnam Avenue and Magee, Putnam Avenue and River, Massachusetts Avenue at Dudley Street, Massachusetts Avenue at Franklin Street.

GATES.

Thirty-six (36) gates have been set during the year as follows:

Twenty-one (21) on extension of main pipes. (See tables on pages 27 and 38).

Ten (10) on renewal of main pipes. (See above tables).

Five (5) on new supplies. (See table on page 38).

In the locations following the gates have been repaired: Ash Street at Acacia Street, Main Street at Osborn Street, Massachusetts Avenue at Walden Street, Pleasant Street at River Street, Reservoir Street, Washington Street at Hillside Avenue.

A thorough inspection of the gates has been made and their locations, carefully marked.

BOXES.

The total number of boxes set during the year was two hundred and twenty seven (227).

Twenty seven (27) iron and six (6) small wooden boxes have been set on the new extension and renewal work.

Twenty one (21) and nine (9) small wooden boxes have been set on new extensions.

Forty two (42) boxes have been set in place of worthless ones and the following: thirty eight (38) iron, two (2) hydrant, one (1) small wooden, one (1) large wooden and six (6) small wooden.

One hundred seventy five (175) meter boxes and one (1) large wooden box have been used in connection with the setting of meters.

At seven (7) locations the boxes have been repaired.

At one (1) location on Hovey Avenue a meter box has been removed.

At twenty one (21) locations the gate boxes have been raised, in thirteen (13) locations the gate boxes have been lowered and in six (6) locations the gate boxes have been reset to conform to the street curbs.

HYDRANTS.

The number of hydrants in use at date, November 30, 1901, is nine hundred seventy eight (978).

Twenty five (25) posts (Chapman) and three (3) flush hydrants have been set during the year. See table of "main pipe laid, hydrants set" on page 27.

Five (5) posts and twelve (12) flush hydrants have been removed during the year as follows: Boston post from Austin Street corner Temple Street; Boston post from Oxborn Street corner Main Street; Chapman post from 125 South Avenue at Broadway; Coffin post from Grant Street at North Street; Coffin post from Norris Street, midway; Perkins post from 125 South Street; this hydrant was broken by a team; and flush hydrants have been removed from Beech Street and Massachusetts Avenue; Broadway at Ellery Street; Broadway at Quincy Street; Ellery Street near Central seventy five (75) feet from Broadway; Garden Street near Walter Street; Massachusetts Avenue near Remington Street; Mt. Auburn Street opposite Athens Street; Mt. Auburn Street at

Bow Street; Mt. Auburn Street corner Dunster Street; Rice Street, five hundred forty (540) feet from Massachusetts Avenue; Walker Street, two hundred seventy (270) feet from Shepard Street; and Western Avenue at Putnam Avenue.

Total number and kind of hydrants in use are as follows :—

Boston	157
Chapman	481
Coffin	41
Flush	119
Holyoke	86
Perkins	94
<hr/>	
Total	978

Hydrants in the locations following have been raised :— Hovey Avenue, Hampshire and Amory Streets; in Douglass Street at Austin Street the hydrant has been lowered.

Posts have been set to protect the hydrants located at the corner of Bent Street and Ninth Street, and Bent Street and Fifth Street.

The hydrants located as follows, have received necessary repairs :— Gore Street at Seventh Street; Harvard Square opposite Dunster Street; Massachusetts Avenue at Frank Street; Ninth Street and Bent Street; Tannery Street at Cambridge City Home; Thorndike Street at House of Correction (this hydrant has been repaired twice at the County's Expense); University Press; Walden Street at Raymond Street.

The Coffin hydrant in Portland Street, near Main Street, and the Boston hydrant in Brookline Street near Henry Street have been relocated.

The annual inspection of hydrants has been made.

METERS.

There have been set ten hundred seventy (1070) meters in new locations during the year.

Early this year the Board decided to place meters on as many of the dwellings in the several wards as the amount of the appropriations would warrant: accordingly a specification was prepared and bids asked for, resulting in the contract being awarded to the Hersey Manufacturing Company of Boston, for its all-composition disc meters to the number of

one thousand (1,000). The work of setting them began on June 13th and on November 19th there had been set, from the list prepared by the Water Department at the direction of the Water Board, eight hundred thirty one (831) meters, in sizes from five eighths inch to one and one half inch, of the following kinds: thirty six (36) were Hervey discs, one (1) Union Valve, one (1) Lambert and one (1) Trident completed the total number of meters set.

Of these 14 were set on Bayston Street, thirty three (33) were set on Main Street, thirty one (31) were set on Cambridge Street, fifteen (15) were set on Orange Street, forty (40) were set on Elm Street, fifteen (15) were set on Harvard Street, eighty eight (88) were set on Mass Street, two hundred thirteen (213) were set on East North Avenue, one hundred eight (108) were set on Prospect Street, thirty six (36) were set on Western Avenue.

The cost of the work has been ten thousand eighty seven dollars and seventy cents (\$10,874.70), an average of twelve dollars and two cents for each meter.

The amount is larger than it would be for other parts of the City, as many of them required setting in the sidewalk, one hundred and thirty six (36) out of the total number being so placed.

The same 81 meters were set in response to petitions received from the residents.

Since the increase of pressure, the City installed meters have been subject to much trouble, with good results.

At the present time eighteen hundred ninety eight (1,898) meters of the following kinds are in use:

Hervey Disc	36	Valve	1
Union Valve	1	Lambert	1
Trident	1	Worthington	1
Other	1,859		

Total number of meters in use in the City, 1,898.

STONY FIELD

Stony Field is a large tract of land, situated in the western part of the City, and is owned by the City. It is a very fertile tract of land, and is used for the purpose of growing crops. It is a very valuable tract of land, and is a very important part of the City.

In caring for this drainage we have been put to great inconvenience in not being able to have the work of removal done as promptly as was desired, and also that the expense was greater than thought necessary. Accordingly an excavating wagon and pump was purchased, and the work of cleaning is being done by this department at greatly reduced cost.

The Brook, near where it enters the basin, has been cleaned out and walled up on each side, and a portion near Kendal Green Station has also been cleaned out. There remains, however, much that would be desirable to have done at as early a date as possible.

A considerable amount of fencing has been done around the upper part of the basin and on the land near the dam.

TABLE SHOWING THE DAILY AVERAGE GALLONS, BY THE MONTH, FLOWING OVER THE WASTE WAY AT STONY BROOK.

	Gallons.	Number of Days.		Gallons.	No.
December, 1900....	12,061,290	31	June, 1901....	17,330,000	
January, 1901....	312,903	4	July, 1901....	No overflow.	
February, 1901....	No overflow.	—	August, 1901....	170,968	
March, 1901....	33,848,387	22	September, 1901....	No overflow.	
April, 1901....	74,080,000	30	October, 1901....	190,323	
May, 1901....	62,270,968	31	November, 1901....	816,666	

Total quantity wasted 6,141,300,000 gal

Total number of days in which water wasted

STONY BROOK PIPE LINE.

The inspection of the gates and air valves along this line has been

During the early spring several leaks developed in the cut leading to the pond, and on examination it was found that the pipe, where it crosses a mud pocket and was laid on piling, had settled and severed the joints were pulled apart so as to cause leaks. The settlement was caused by the breaking of the cross timbers on which the pipe rested. New piles were driven and new cross timbers of 8-inch x 8-inch, white oak, were put in and the whole made as secure as possible. Several other leaks were found in the cut which seemed to show that the joints were not properly driven when the pipe was laid.

The expense attending this work chargeable to Maintenance was eight hundred ninety-four dollars and eighty-eight cents (\$894.88). Your attention is respectfully called to the fact that there was no appropriation in the above account for such an expensive leak.

Month	Day	Time	Flow	Pressure	Temperature	Remarks	Notes
Aug. 16, 1901	8:10	Aug. 1, 1901	101.00	101.00	101.00	Aug. 1, 1901	Aug. 1, 1901
Aug. 16, 1901	79.00	Aug. 16, 1901	100.00	100.00	100.00	Aug. 16, 1901	Aug. 16, 1901
Aug. 16, 1901	80.00	Aug. 1, 1901	100.00	100.00	100.00	Aug. 1, 1901	Aug. 1, 1901
Oct. 11, 1901	79.00	Oct. 1, 1901	100.00	100.00	100.00	Oct. 1, 1901	Oct. 1, 1901
Oct. 17, 1901	81.10	Oct. 11, 1901	100.00	100.00	100.00	Oct. 11, 1901	Oct. 11, 1901
Nov. 1, 1901	79.00	Nov. 1, 1901	100.00	100.00	100.00	Nov. 1, 1901	Nov. 1, 1901
Nov. 10, 1901	81.00	Nov. 10, 1901	100.00	100.00	100.00	Nov. 10, 1901	Nov. 10, 1901
Total							
40.77							

missing

Aug. 1901
Nov. 1, 2, 3Oct. 1901
Nov. 1901Nov. 1901
Dec. 1901

HOBBS BROOK.

The height of water in this basin is at present 179.25 feet — 1.75 below high water. Water was drawn from here from February 26 to March 14, from July 21 to August 8, from August 14 to 26, and from September 7 to date, November 30, 1901.

It was hoped that this season would be favorable for doing quite an amount of ditching in the meadows at the upper part of the basin, but the height of the water has prevented doing as much as we had wished; however, the Brook has been partly cleaned and we are in hopes to have the ditches on the Evans farm cleaned before spring.

The brush along the fence has been cut and burned and the standing grass sold.

A twelve-inch drain from the lower side of Winter Street Dam to opposite the Stearns place has been in course of construction for the past month, more than half of the work is finished and a few weeks more should suffice to finish it.

RECAPITULATION.

NEW SUPPLIES.

	6 Inch	4 Inch	3 Inch	2 Inch	1½ Inch	1¼ Inch	1 Inch	¾ Inch	Total
Length, in feet, of pipe.....	344	364	35½	422	300	559½	1,740	4,481	8,246
Number of supplies.....	2	4	1	4	8	9	44	129	201
Number of stop and waste valves.....				4	9	7	44	115	179
Number of screw cocks.....				5	9	11	43	122	190
Number of sidewalk cocks.....						8	42	113	163
Number of service boxes.....									161
Number of gates.....	1	4							5
Number of gate boxes.....									10
Number of wooden boxes.....									8

MAIN PIPE.

	12 Inch	10 Inch	8 Inch	6 Inch	4 Inch	2 Inch	Total
Length, in feet, of pipe, extension.....	8	29	.....	3,179	803	107	4,126
Length, in feet, of pipe, renewals.....		1,112	2,069	2,569			5,750
Total length, in feet, of pipe.....	8	1,141	2,069	5,748	803	107	
Number of gates.....		2	1	20	8		
Number of hydrants.....							

COMPARATIVE TRENDING, FOR THE PAST TEN YEARS

Expenditures	Materials	Supplies	Total Paid	Miles
\$1,700	\$1,000	\$1,000	\$2,700	0.75
15,000	1,000	10,000	12,000	0.80
11,000	1,000	17,000	19,000	0.80
11,000	11,000	22,000	34,000	0.87
11,000	11,000	17,000	28,000	1.10
11,000	11,000	14,000	26,000	1.10
11,000	11,000	17,000	28,000	0.81
11,000	11,000	11,000	22,000	0.80
11,000	11,000	11,000	22,000	1.11
11,000	11,000	11,000	22,000	1.00

Very respectfully forward the report of the Chief Engineer of the
 1914-1915.

Which is respectfully submitted,

F. C. BROOKS,
Superintendent

REPORT OF THE PUMPING ENGINEER

CAMBRIDGE, December 2, 1901.

To the Honorable, the Water Board of the City of Cambridge.

GENTLEMEN:—I would report that the Leavitt engine No. 7, has pumped all the water used by the City the past year, without any expense for repairs.

Worthington engines Nos. 1 and 2, and Blake engine No. 6, have not been started the past year except to move them by water pressure weekly, for safety.

The fire-room walls have been painted two coats of cold water paint and the boiler covering and all the iron work two coats of lead and oil. This has been done by the employees at the Station at a cost for material only.

The machinery and fixtures at the Station are in first-class condition.

The shower bath which was put in the fire-room the past year has proved a great benefit to the employees in warm weather and been appreciated by them.

You will notice by the pumping record quite a difference in duty between the first six months and the remainder of the year, in favor of coal by cargo over that teamed which runs very unevenly as to quality and dryness.

Respectfully submitted,

(Signed)

E. I. HARRIS,
Chief Engineer.

OPERATING EXPENSES AT PUMPING STATION

Cost	\$5,125.75
Cooperative Work	11.86
Electricity	28.16
Gas	49.80
Heating	27.00
Insurance and parking	323.07
Interest	351.82
Lighting	33.65
Materials and tools	243.34
Telephone	108.66
Taxes and license	205.36
Wages and salaries	87.35
Subtotal	8,018.38
	\$13,020.19

CONJUGATE FOLD DIVERS AND RAINFALL

Name of Machine	Running Time		Total Water Pumped	Average Water Pumped	Total Cost (Consumed)	Average Cost per Gallon	Average Height of Fall	Horse Pwr.
	Mins	Secs						
1905	20	30	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1906	100	15	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1907	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1908	100	10	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1909	100	10	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1910	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1911	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1912	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1913	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1914	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1915	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1916	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1917	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1918	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1919	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1920	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1921	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1922	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1923	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1924	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1925	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1926	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1927	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1928	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1929	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1930	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1931	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1932	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1933	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1934	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1935	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1936	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1937	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1938	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1939	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1940	100	05	720,000.00	110.00	\$90.00	0.000125	15.00	1.00
1941	100	05	720,000					

REPORT OF THE COMMISSIONERS OF THE SINKING FUNDS OF THE CITY OF CAMBRIDGE

To the Honorable, the City Council:—

The undersigned, Commissioners of the Sinking Funds of the City of Cambridge, herewith submit the annual report of the Water Works Sinking Fund committed by law to their charge. The report covers the year ending November 30, 1901.

The following statement shows the present condition of the Water Loan Sinking Fund:—

DR.	
Amount of the Fund, November 30, 1900	\$604,326 58
Received during the year as follows:—	
From the Treasurer of the City of Cambridge, the annual required appropriation from the water rates, viz.	122,352 80
From the sale of the old reservoir site	13,278 67
From interest on investments	23,807 90
	<u>\$763,765 95</u>
CR.	
Amount paid for accrued interest on investments purchased	\$868 42
Amount paid for premiums on investments purchased	5,165 99
Leaving the amount of the Fund, November 30, 1901	<u>757,731 54</u>
	\$763,765 95

FRANK A. ALLEN,	} <i>Commissioners of the Sinking Funds of the City of Cambridge.</i>
JOHN C. BULLARD,	
GEORGE H. HOWARD,	
ANDREW J. LOVELL,	
J. HENRY RUSSELL,	
DANA W. HYDE,	

The following are the investments belonging to the Funds:—

Cambridge	City	bonds 4s,	Maturing Feb.	1, 1913	\$2,000 00
"	"	" 4s,	" Oct.	1, 1916	65,100 00
"	"	" 3 1-2s,	" Dec.	1, 1917	40,000 00
"	"	" 3 1-2s,	" Nov.	1, 1919	20,000 00
"	"	" 4s,	" Nov.	1, 1920	5,000 00
Lynn	"	" 4s,	Jan.	1, 1905	19,000 00
Wakefield	Town	" 4s,	" Oct.	1, 1905	<u>5,000 00</u>
<i>Amount carried forward</i>					<i>\$156,100 00</i>

COMMISSIONERS OF SINKING FUND.

43

Amount brought forward

£124,100 00

Source of	Town Bonds 1850-1900 Maturing Apr	1, 1905	£20,000 00
London & N. W.	City	July 1, 1905	20,000 00
Edinburgh	Town	Sept 14, 1905	2,000 00
W. of London	"	Oct 1, 1905	6,000 00
Birmingham	City	Nov 1, 1905	5,000 00
Cardiff	"	Nov 15, 1905	2,000 00
W. of London	Town	Oct 1, 1907	6,000 00
Birmingham	City	Nov 1, 1907	5,000 00
Cardiff	"	Nov 15, 1907	2,000 00
Edinburgh	Town	May 1, 1908	5,000 00
Birmingham	"	Aug 1, 1908	10,000 00
W. of London	"	Oct 15, 1908	6,000 00
Birmingham	City	Nov 1, 1908	5,000 00
Cardiff	"	Nov 15, 1908	2,000 00
W. of London	Town	Dec 1, 1908	12,000 00
W. of London	City	Feb 1, 1909	16,000 00
Birmingham	Town	Aug 1, 1909	15,000 00
W. of London	"	Oct 15, 1909	6,000 00
Birmingham	City	Nov 1, 1909	5,000 00
Cardiff	"	Nov 15, 1909	2,000 00
Edinburgh	"	June 1, 1910	21,000 00
Birmingham	"	July 1, 1910	6,000 00
W. of London	Town	Oct 15, 1910	6,000 00
Cardiff	City	Nov 15, 1910	2,000 00
Edinburgh	"	June 1, 1911	15,000 00
W. of London	Town	Oct 15, 1911	12,000 00
Cardiff	City	Nov 15, 1911	2,000 00
Edinburgh	"	Apr 1, 1912	10,000 00
W. of London	Town	Oct 1, 1912	1,000 00
Cardiff	City	Nov 15, 1912	2,000 00
"	"	Nov 15, 1913	2,000 00
"	"	Nov 15, 1914	2,000 00
"	"	Jan 1, 1915	16,000 00
Birmingham	Town	May 1, 1915	2,500 00
Cardiff	City	Nov 15, 1915	2,000 00
W. of London	Town	May 1, 1916	2,500 00
W. of London	"	Mar 1, 1917	2,000 00
W. of London	City	Apr 1, 1917	24,000 00
W. of London	Town	May 1, 1917	2,500 00
Edinburgh	City	Jan 1, 1918	15,000 00
W. of London	Town	Mar 1, 1918	1,000 00
W. of London	"	May 1, 1918	2,500 00
"	"	May 1, 1919	2,500 00
W. of London	Town	May 1, 1920	2,500 00
W. of London	"	Aug 1, 1920	25,000 00
W. of London	City	Oct 1, 1920	5,000 00
Cardiff	"	May 1, 1921	2,000 00
"	"	May 1, 1924	1,000 00
"	"	May 1, 1925	2,000 00
"	"	May 1, 1926	2,000 00
"	"	May 1, 1927	2,000 00
W. of London	Town	July 1, 1927	10,000 00
Cardiff	City	May 1, 1928	2,000 00

£124,100 00

Amount carried forward

£124,100 00

COMMISSIONERS OF SINKING FUNDS.

<i>Amount brought forward</i>						\$615,400 00
Winchester	Town bonds 4s,	Maturing	June 1, 1928		\$6,000 00	
Quincy	City " 4s,	"	May 1, 1929		3,000 00	
Fall River	" " 3 1-2s,	"	Nov. 1, 1929		75,000 00	
Quincy	" " 4s,	"	May 1, 1930		3,000 00	
"	" " 4s,	"	May 1, 1931		3,000 00	
"	" " 4s,	"	May 1, 1932		1,000 00	
Newton	" " 4s,	"	Aug. 1, 1935		2,000 00	
"	" " 4s,	"	July 1, 1936		11,000 00	
Grafton	Town " 3 1-2s,	"	July 1, 1937		1,000 00	
Old Colony R. R. Co.		4s,	Jan. 1, 1938		25,000 00	
Grafton	Town bonds 3 1-2s,	"	July 1, 1938		2,000 00	
"	" " 3 1-2s,	"	July 1, 1939		2,000 00	
						<u>\$134,000 00</u>
						749,400 00
Cash deposited in bank						<u>8,331 54</u>
						<u>\$757,731 54</u>

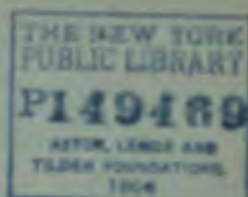
The Bonded Water Debt, which the foregoing Fund is to pay, matures as follows:—

Nov. 1, 1906	3 1-2s	\$43,000 00
Oct. 1, 1907	4s	90,000 00
Nov. 1, 1907	4s	22,000 00
July 1, 1908	4s	46,000 00
Aug. 1, 1908	4s	25,000 00
July 1, 1909	4s	20,000 00
May 1, 1910	4s	288,000 00
July 1, 1910	4s	75,000 00
Sept. 1, 1910	4s	125,000 00
Jan. 1, 1911	4s	20,000 00
Oct. 1, 1911	4s	35,000 00
Jan. 1, 1912	4s	150,000 00
May 2, 1912	4s	75,000 00
Nov. 1, 1912	4s	45,000 00
Feb. 1, 1913	4s	100,000 00
Aug. 1, 1913	4s	50,000 00
Apr. 1, 1915	4s	200,000 00
Aug. 1, 1915	4s	200,000 00
Apr. 1, 1916	4s	100,000 00
July 1, 1916	4s	200,000 00
Aug. 1, 1916	4s	100,000 00
Oct. 1, 1916	4s	265,100 00
Apr. 1, 1917	3 1-2s	200,000 00
July 1, 1917	3 1-2s	100,000 00
Nov. 1, 1917	3 1-2s	75,000 00
Dec. 1, 1917	3 1-2s	140,000 00
May 2, 1918	3 1-2s	50,000 00
June 1, 1918	3 1-2s	60,000 00
Nov. 1, 1918	3 1-2s	50,000 00
Nov. 1, 1919	3 1-2s	23,000 00
Nov. 1, 1920	3 1-2s	30,000 00
July 1, 1921	3 1-2s	30,000 00
Apr. 1, 1924	4s	300,000 00
		<u>\$3,332,100 0</u>

Annual Report

OF

★
THE WATER BOARD



902

City of Cambridge

MASSACHUSETTS

VDLA-P-B



City of Cambridge
Massachusetts

ANNUAL REPORT

OF

THE WATER BOARD

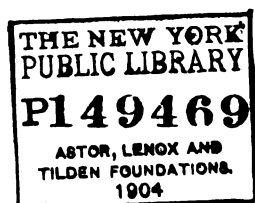
FOR THE

YEAR ENDING NOVEMBER 30, 1902



PRINTED FOR THE DEPARTMENT

[Handwritten signature]



CAMBRIDGE WATER BOARD

1903

President.

WILLIAM B. DURANT

Members of the Board.

WILLIAM B. KELLEY	Term expires 1902
WILLIAM S. FILLMORE	Term expires 1903
EDWARD STEVENS	Term expires 1904
JOHN M. HOWARD	Term expires 1905
WILLIAM B. DURANT	Term expires 1906

WALTER H. HARDING, Clerk

Superintendent of Works.

EDWIN C. BROOKS

Water Registrar.

WALTER H. HARDING

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1865-1902.

CHESTER W. KINGSLEY . . .	1865-1894	
JOHN SARGENT . . .	1865-1871	
A. K. P. WELCH . . .	1865-1871	
ROBERT DOUGLASS . . .	1865-1871	
SAMUEL SLOCOMB . . .	1865-1876	
Z. L. RAYMOND . . .	1871	
HENRY L. EUSTIS . . .	1871-1885	
J. WARREN MERRILL . . .	1871-1881	
GEORGE P. CARTER . . .	1871-1883	
JOHN H. LEIGHTON . . .	1876-1879	
KNOWLTON S. CHAFFEE . . .	1879-1889	
JAMES M. W. HALL . . .	1881-1899	
LEANDER M. HANNUM . . .	{ 1883-1884 1885-1893	
JOHN F. O'BRIEN . . .	1884-1895	
GEORGE H. HOWARD . . .	1889-	(Now in Office.
E. BURT PHILLIPS . . .	1893-1896	
STILLMAN F. KELLEY . . .	1894-	(Now in Office.
FRANK A. ALLEN . . .	1895-1899	
WELLINGTON FILLMORE . . .	1896-	(Now in Office.
EDMUND H. STEVENS . . .	1899-	(Now in Office.
WILLIAM B. DURANT . . .	1899-	(Now in Office.

Presidents of the Board.

J. WARREN MERRILL . . .	1865-1867
ERZA PARMENTER . . .	1867
JOHN SARGENT . . .	1867-1871
J. WARREN MERRILL . . .	1871-1873
CHESTER W. KINGSLEY . . .	1873-1876
GEORGE P. CARTER . . .	1876-1883
CHESTER W. KINGSLEY . . .	1883-1894
JAMES M. W. HALL . . .	1894-1899
WILLIAM B. DURANT . . .	1899-

REPORT OF THE CAMBRIDGE WATER BOARD

CAMBRIDGE, December 13, 1902.

To the Honorable the City Council of the City of Cambridge

The thirty-eighth annual report of the Cambridge Water Board, for the year ending November 30, 1902, is hereby submitted for your consideration.

The several reservoirs of the City, with the appurtenances, including the channels of Holden Brook, and of Stony Brook, the main supply main and distributing pipes, pumping station, engines and boilers, and water machinery and appliances, are all in good order and condition and equal to the high standard of previous years. Repairs have in some cases become necessary, especially upon a portion of the main supply pipe from Holden Brook, and an allowance for such repairs will have to be made in the appropriation for maintenance for the ensuing year.

A few suits for damages for land taken, and for damage to land, are still pending, and it is hoped that these suits will be adjusted during the coming year. When they shall be adjusted, an appropriation for construction Account will have to be made and provided for, by the issue of bonds as usual.

FINANCIAL STATEMENT IN BRIEF

The total cost of the Water Works to November 30, 1902, was	\$3,702,639 25
There was expended during the year on Construction Account	71,673 87
Whence the total cost to November 30, 1902, was	\$3,774,313 02

WATER BOND ACCOUNT

The whole amount of bonds outstanding is	\$1,320,000 00
deducting from this sum the present value of the Water Debt Sinking Fund, exclusive of the note of the City for \$200,000	197,630 00
leaves as the net Water Debt	\$1,122,370 00
For further details of the financial condition of the department, reference may be made to the statement of the Registrar appended to this report. From that statement it appears that the excess of receipts over expenditures during the past year is the sum of	\$2,171 86

FRESH POND.

In making up the annual estimates for the year, the Board recommended an appropriation of \$10,000, for the purpose of completing in part the unfinished work around Fresh Pond, in the vicinity of the corner of Concord Avenue, at and near the corner of Huron Avenue. This work has been done in a thorough and substantial manner, and in accordance with the original designs of Messrs. Olmsted Brothers, the landscape gardeners, who have planned other improvements heretofore made at Fresh Pond, and the result has been a great increase in the beauty of the landscape, and has been much commended by all who have visited the place.

It is admitted by those interested in park work, that the Fresh Pond surroundings have the best natural advantages for park improvement of anything in the Metropolitan Park District, and all that is needed to complete the work is the necessary funds. When this task is finally completed we shall not only have something of which Cambridge may well be proud, but also a great contribution to health in that locality, for in the course of this work, the low, marshy, malarial lands adjoining the Pond, are being filled to a level that removes all danger of malaria, mosquitoes, and everything detrimental to good health. If this City is to have parks it would seem the height of folly not to finish the Fresh Pond Park System, especially since the land is already owned by the City. Fresh Pond Park is, in area, considerably more than one-half of the whole park system of the City.

It should also be borne in mind that, since the park work was begun in 1896, all the expense connected with the work has been paid out of surplus water receipts, and none of it from the general tax levy. Moreover the money expended on this improvement is all expended for labor, performed by the laboring men of Cambridge. It is earnestly hoped that this work may be advanced more rapidly in the future, and especially that Kingsley Park may be finished from the next appropriation for this purpose.

WATER BASINS.

On the first day of December, 1901, the water in Hobbs Brook Reservoir was one foot nine inches below high water mark, Stony Brook

was overflowing the dam, and Fresh Pond was about two feet below high water mark. On the first day of December, 1902, the water in Holden Brook Reservoir was two and one-half feet below high water mark, Stony Brook Reservoir was four inches below high water mark, and Fresh Pond was three feet three inches below high water mark. The shrinkage in Fresh Pond is not immediately alarming, but deserves careful consideration in view of the increased total consumption of water, herein-after referred to, and especially in view of the fact that the main supply pipe from Stony Brook to Fresh Pond, has been delivering water to the Pond at its utmost capacity, during the whole year, and yet it is impossible to keep the Pond full.

STONY BROOK OVERFLOW.

The overflow at Stony Brook, which, as the City Council is aware, occurs almost wholly in the Winter and Spring, and which runs to waste in that season, is due for the reason that there is no storage basin below the dam, except Fresh Pond, and no pipe sufficient to carry the water to it. Figures were taken a basin for the year ending December 1, 1902, amounting to

6,539,100,000 gallons.

The amount of water overflowed was

6,141,000,000 "

The amount of water used

1,397,800,000 gallons.

It is to be stated that there is no possibility of constructing a storage basin between the dam at Stony Brook and Fresh Pond, and that the storage capacity of Fresh Pond is well limited in extent. Otherwise, when a new main supply pipe shall have been laid, as will become necessary in the near future, a portion of the water so wasted could be saved.

RESULTS OF EXAMINATION OF WATER FROM FRESH POND AVERAGED BY YEARS

	Parts per 100,000			
	Free Ammonia	Chlorine	Nitrogen as Nitrates	Nitrogen as Nitrites
1887	0.106	28	0.287	0.0006
1888	0.081	26	0.281	0.0007
1889	0.074	29	0.271	0.0004
1890	0.070	22	0.272	0.0006
1891	0.040	24	0.265	0.0006
1892	0.069	20	0.250	0.0006

WATER BOARD.

	Free Ammonia.	Chlorine.	Nitrogen as Nitrates.	Nitrites.
1899.....	.0048	.56	.0332	.0005
1900.....	.0088	.54	.0128	.0005
1901.....	.0026	.54	.0323	.0003
1902 (11 months).....	.0047	.55	.0316	.0004
Average for past 10 years	.0057	.61	.0275	.0005
For two years ending May 6, 1889	.0134	1.37	.0281	.0007

The above analyses indicate that the quality of the water in Fresh Pond has suffered no deterioration during the last ten years, and it may be added, that it compares very favorably with the water supplies of most other cities. The analysis of the two-year period ending May 6, 1889, is added, to show the progress made since that date.

The amount of chlorine in the water is one of the most conclusive indications of pollution or non-pollution; reference being had, of course, to the normal chlorine of the district. The normal chlorine at Fresh Pond is 0.45. The above table shows great improvement in that respect since 1889. The free ammonia, also an item of suspicion, has been greatly reduced since that date. The normal chlorine of Fresh Pond is taken from the map of normal chlorines, or isochlors, annexed to the Report of the State Board of Health for the year 1890.

RAIN-FALL.

The annual rain-fall for the past ten years at Fresh Pond is as follows : —

	Inches.
1893	40.49
1894	35.85
1895	47.12
1896	38.82
1897	42.53
1898	52.42
1899	37.28
1900	46.89
1901	46.20
1902	43.31
Average	43.09

The rain-fall for the year at Hobbs Brook was 42.24 inches; at Stony Brook, 44.58 inches.

CONSUMPTION OF WATER.

The total consumption of water for the year ending December 1, 1902, was	2,937,553,543 gallons
For the year ending December 1, 1901	2,795,129,640 "
Excess of consumption this year	142,423,903 gallons
The excess of consumption in the year ending December 1, 1902, over the year ending December 1, 1901, was	133,679,320 "
Difference in excess of 1902 over excess of 1901.	8,744,583 gallons

In 1897 the total consumption was 1,961,362,760 gallons. The annual increase or decrease, since that year is fully shown in the Report of the Engineer, herewith filed.

These figures deserve careful study, and ought to impress upon the community the fact which the Board has heretofore repeatedly urged upon governing City governments, namely, that something must be done to increase the supply at Fresh Pond, or diminish the consumption of water by checking waste. Before many years, both methods must be adopted. The idea that water is as abundant as air, to be used as lavishly, and wasted at pleasure, has long been exploded. Inasmuch as the Metropolitan Board, having under their control the Nashua River, and the enormous mass which they have constructed among the hills of Worcester County are already apprehending a scarcity of water, and are recommending the general use of meters in order to check unnecessary consumption, it behooves Cambridge not to neglect the lesson. The Board do not enjoy watching the Nile of Cambridra all the time, but would be derelict in their duty if they did not repeat what they have said in previous reports and communications, that something ought to be done at once, to adjust the capacity of our water supply to the increasing demands of the growing population of the City.

FIRST READING. METERS.

The daily per capita consumption of water, including unmetered and metered water, in 1902 was	63.77 gallons
The daily per capita consumption of water, including unmetered and metered water, in 1901 was	61.07 "
Increase	2.70 gallons
The daily per capita consumption of metered water in 1902 was	57.57 gallons
The daily per capita consumption of metered water in 1901 was	51.23 "
Increase	6.34 gallons

These figures include both water used for domestic purposes and water used for manufacturing purposes (which latter is all metered).

The total consumption of metered water used for business purposes only, during the year 1902, was 110,903,000 gallons in excess of such consumption in 1901, indicating that the most of the increase of total consumption for the year was due to increased use of water in manufacturing. This excess is equal to a consumption *per capita* of 3.54 gallons, which nearly accounts for the increase *per capita* of metered water above shown; *viz.*, 4.15 gallons.

A separate canvass of 812 domestic meters set last year, covering a population of 8,407, shows that the daily *per capita* consumption of water used for domestic purposes only, was 35.87 gallons.

These figures indicate plainly enough, what has never been questioned by any one familiar with the subject, that the use of meters greatly decreases waste of water.

The Board have corresponded with the Water Boards of many cities and towns using meters, and their testimony is uniformly to that effect. The correspondence is at the service of any member of the City Government, but is too voluminous to be inserted in this report. Among the cities and towns reporting a reduction in the consumption of water, as the result of setting meters, are the cities of Brockton, Brookline, Fitchburg, Hartford, Lynn, Lowell, Fall River, Manchester, N. H., New Bedford, Newton, Pawtucket, R. I., Providence, R. I., Springfield, Waltham and Worcester.

The attitude of the Metropolitan Board has already been referred to, and has been approved by Governor Crane, in his message to the General Court of 1902.

A brief extract from the message is as follows : —

“The Water Board last year called attention to the great increase from year to year in the consumption of water in the district, and its successor has begun extended investigations relative to the excessive use and waste of water. This increase not only necessitates a great increase in current expenses, but it hastens the time when still greater expenditures must be incurred, not only for new sources of supply, but also for new pumping facilities, new aqueducts, and new pipe mains. There is undoubtedly a considerable consumption of water which is excessive and wasteful, and which can be prevented. Some method should be devised

in every city and town, if not every individual water taker, shall be interested in the prevention of waste, and of excessive use of water.

Meters have been introduced into some municipalities with beneficial effect. It is now worthy of consideration, whether the use of meters, wherever it is not right not to be compelled, or at least whether some measure may not be adopted, whereby municipalities and water takers may be encouraged in the use of meters, by the promise of financial advantage.

The Chief Engineer of the Metropolitan Board, in his annual report to the Board says:

"It is time that measures should be taken to prevent or restrict the excessive and wasteful use of water, and there is no method by which this can be done so efficiently, as by providing that water shall be furnished to every water taker through a meter. Some legislation should be enacted whereby the several cities and towns shall be induced, or required, to introduce meters, so that, at the end of ten years, all or nearly all of the water supplied to takers shall be furnished through meters."

In previous communications to the City Council, the Board have always expressed the same view that the Governor takes in his message, namely, that the excessive use and waste of water hastens the time when greater expenditures must be incurred for new aqueducts and new pipe mains. The longer this time can be postponed, the more saving can be made in expense. If, for instance, by the aid of a complete meter system, the laying of a new main pipe from Stony Brook can be postponed for five years, the interest and sinking fund payments for five years, upon the money loaned which will be necessarily incurred for such pipe, less the amount of interest amount on the amount of funds raised for meters, will be saved to the City.

There are at present in use, in all, two thousand one hundred and thirty seven meters. To furnish all domestic supplies with meters, would require about eight thousand additional meters at an estimated cost of about one thousand dollars.

Approximately one fifth of the required number of meters have already been set, by authority of the City Council, and with its approval, a scheme is being adopted to complete the work as soon as possible.

Moreover, it may be questioned whether it is fair to charge the water takers having meters, according to meter rates, and the other water takers, schedule rates. If the meters are financially a disadvantage to the consumer, as some claim, one-fifth of the consumers should not be placed in a worse position than the remaining four-fifths. On the other hand, if the meters are financially a benefit (as they certainly are to the careful consumer) the four-fifths are entitled to the same privilege as the one-fifth.

It is plainly just that each water taker should pay only for the water which he uses, and wastes, and should not be obliged, as he now is, (unless he has a meter) to pay also for what his neighbor uses and wastes.

The Water Board unanimously recommend, as the first remedy to be applied, the immediate installation of a complete meter system, and, to that end, advise the appropriation of a sum of twenty-five thousand dollars, to be charged to Water Works Construction Account, and met by an issue of bonds to be paid out of Water Works receipts, in the manner provided by law. This sum will probably provide for all the meters that the Board can set during the year. No new application to the Legislature would be necessary to provide for the issue of bonds for this purpose, as a sufficient number, heretofore authorized, remain unissued.

SECOND REMEDY, NEW PIPE LINE.

If the City Council decide not to concur with the views of the Board, above expressed, immediate provision should be made for a new pipe line from Stony Brook to Fresh Pond, so that the Pond may be kept full enough to meet the growing consumption, until the other remedy, a complete meter system, shall also become necessary, as it undoubtedly will. This enterprise will necessarily consume considerable time. The first step must be the presentation to the Legislature, of a petition for the issue of the necessary amount of water bonds, in order to pay for the construction of the line.

Under the joint rule of the two branches of the Legislature, ("12th joint rule,") this petition should be presented before the first Wednesday of February. The petition must be authorized by vote of the City Council. If granted by the Legislature, the next step will be a complete

survey of the line by a competent engineer. This will probably consume at least a year, especially as there are some difficult problems to be solved, in connection with such variations from the old route as are sure to be necessary. The proposals for pipe, contracts for pipe, and procuring the pipe will require a considerable delay, and lastly, the actual construction will probably consume another year, possibly two years. Hence the first step must be taken at once. From estimates made by engineers, the cost of construction, including land damages, would not be less than five hundred thousand dollars. Consequently, in the event that the Council sees fit not to make the requisite appropriation for the purchase of meters, the Board recommend the immediate passage of an order, authorizing the Mayor to petition the Legislature for authority to issue bonds to the amount of five hundred thousand dollars, for Water Works Construction, in addition to the amount already authorized, but not issued, according to the provisions of Chapter two hundred and fifty six of the Acts of the year 1904 and the amendments thereto.

During the year, the Board recommended to the City Council, the adoption of the annual charge of \$2 for meter rental, thereby making the minimum annual charge for metered water \$5. a charge, as the Board are informed, is not less than the average minimum charge for metered water in other cities. This change is especially for the benefit of small consumers, and the proposed minimum charge is less than the minimum charge for ordinary domestic use under schedule rates.

The recommendation of the Board was referred to the Committee on Water Supply, who made a favorable report to the City Council, and returned the recommendation to the Committee on Ordinances, which has now considered it. The Board hope that the City Council will see that this amendment is incorporated into the ordinances early during the coming year.

Respectfully submitted,

WILLIAM B. DURANT,
STILLMAN F. KELLEY,
GEORGE H. HOWARD,
WELLINGTON FLEMING,
EDMUND H. STEVENS.

Centerville Water Board

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 3, 1902.

To the Cambridge Water Board:—

GENTLEMEN:—In compliance with the requirements of the City Ordinance I present the thirty-eighth annual report of the operations of this department showing the receipts, expenditures and abatements, together with a statement of the number of water takers, etc., for the year ending November 30, 1902.

Amount of bills remaining unpaid November 30, 1901:—

Water rates	\$428 34
Supplies and repairs	1,004 51
Off and on	118 00
Seals	6 00
Maintenance account	393 91

Amount of bills placed in hands of City Treasurer for collection from November 30, 1901, to November 30, 1902:—

Water rates.	\$332,345 99
Supplies and repairs	4,146 42
Off and on	504 00
Rents	168 00
Seals	111 25
Maintenance account	1,685 27
Construction account	827 13
Total bills	<u>\$341,738 83</u>

There has been collected:—

Water rates	\$326,500 53
Supplies and repairs	3,849 15
Off and on	488 00
Rents	168 00
Seals	107 50
Maintenance account	1,583 30
Construction account	749 50

WATER REGISTRATION

17

There has been stated

Water rates of and on and scale supplies and repairs,
and construction account \$3,945 63

There remains to be collected

Water rates	\$2,317 12
Supplies and repairs	1,941 33
off and on	124 00
Scale	7 23
Maintenance account	463 84
Construction account	77 63
	<hr/> \$41,726 00

EXPENDITURES

Construction - General account	\$12,941 80
Maintenance - General account	63,900 34
	<hr/> \$76,842 14

STATEMENTS

Water rates and supply and repair bills to the amount of \$3,945 63

APPENDIX

Water rates to the amount of	\$3 000 00
Water amount deducted from receipts	396 300 33
	<hr/>
Amount not received for water	\$323,697 33
Net of and on scale rates scale and Maintenance account	2,316 80
	<hr/>
Amount not received of scale scale etc	\$323,647 33

OFF AND ON

Water has been shut off for non payment of rates, or for order on account of various, and scale have been applied to fixtures by request of owners as follows

Water shut off in 1902	175
Supplies and on shut off in 1902	625
Supplies and on shut off in previous years	100
Scale supplies and on	166
Scale rates applied to fixtures in 1902	730
Scale rates removed, put on in 1902	200
Scale rates removed, put on in previous years	670

Statement of yearly revenue received from water rates since the purchase of the works by the City:—

From April 28, 1865, to December 1, 1865	832,367 19
From December 1, 1865, to December 1, 1866	40,073 27
From December 1, 1866, to December 1, 1867	53,733 62
From December 1, 1867, to December 1, 1868	63,747 42
From December 1, 1868, to December 1, 1869	76,149 30
From December 1, 1869, to December 1, 1870	92,605 95
From December 1, 1870, to December 1, 1871	111,783 65
From December 1, 1871, to December 1, 1872	127,301 30
From December 1, 1872, to December 1, 1873	146,117 32
From December 1, 1873, to December 1, 1874	153,634 27
From December 1, 1874, to December 1, 1875	188,890 37
From December 1, 1875, to December 1, 1876	179,166 76
From December 1, 1876, to December 1, 1877	154,843 59
From December 1, 1877, to December 1, 1878	157,443 91
From December 1, 1878, to December 1, 1879	164,681 90
From December 1, 1879, to December 1, 1880	173,325 49
From December 1, 1880, to December 1, 1881	170,062 73
From December 1, 1881, to December 1, 1882	177,430 80
From December 1, 1882, to December 1, 1883	179,361 89
From December 1, 1883, to December 1, 1884	161,526 27
From December 1, 1884, to December 1, 1885	185,544 36
From December 1, 1885, to December 1, 1886	199,404 43
From December 1, 1886, to December 1, 1887	204,748 64
From December 1, 1887, to December 1, 1888	211,156 27
From December 1, 1888, to December 1, 1889	221,124 70
From December 1, 1889, to December 1, 1890	231,116 32
From December 1, 1890, to December 1, 1891	227,054 53
From December 1, 1891, to December 1, 1892	237,527 06
From December 1, 1892, to December 1, 1893	242,219 78
From December 1, 1893, to December 1, 1894	250,032 71
From December 1, 1894, to December 1, 1895	268,813 62
From December 1, 1895, to December 1, 1896	281,030 00
From December 1, 1896, to December 1, 1897	291,457 63
From December 1, 1897, to December 1, 1898	297,129 78
From December 1, 1898, to December 1, 1899	302,569 00
From December 1, 1899, to December 1, 1900	319,479 37
From December 1, 1900, to December 1, 1901	320,468 01
From December 1, 1901, to December 1, 1902	323,500 53

COMPARATIVE STATEMENT.

	1901.		1902.	
CONSTRUCTION ACCOUNT. (HORNS BROOK RESERVOIR.)				
<i>Received.</i>				
From bonds issued.....				\$6,000 00
<i>Expended.</i>				
Construction of reservoir, land settlements, etc.....			\$5,447 60	
Services of City Solicitor.....			500 00	
Balance to credit of Construction Account.....			52 40	
				\$6,000 00
CONSTRUCTION ACCOUNT. (GENERAL.)				
<i>Received.</i>				
Balance from 1901.....			\$13,998 20	
From bonds issued.....	\$30,000 00		2,500 00	
From premium on bonds... ..	1,580 00		724 65	
From balance of 1900.....	14,575 52			
From sale of old material, etc....	91 89		749 50	
		\$46,196 91		\$17,972 35
<i>Expended.</i>				
Sundry bills and pay rolls.....	\$32,198 71		\$16,999 14	
Balance to credit of Construction Account.....	13,998 20		973 21	
		\$46,196 91		\$17,972 35
MAINTENANCE ACCOUNT.				
<i>Received.</i>				
From "rates, fines, etc.".....	\$321,410 01		\$331,249 66	
From sale of shrubs, grass, etc....	2,561 88		1,583 80	
Supply and repair account.....	5,253 08		3,849 15	
		\$329,224 47		\$336,682 11
<i>Expended.</i>				
Care and repairs.....			\$62,298 87	
For work at Fresh Pond.....			9,596 85	
Interest on water debt	\$197,109 00		129,579 00	
Making fund requirements.....	119,703 75		120,828 75	
Rent of offices.....			1,200 00	
Care and repair, pipes and fittings	79,239 18			
Ice for drinking fountains.....	447 11		461 47	
Abatements	76 88		3,985 63	
Refunds.....			3,000 00	
Interest of 1902 unpaid and reap- propriated for 1903.....			2,160 00	
Excess of receipts.....	2,649 05		2,171 54	
		\$329,224 47		\$336,682 11
Maintenance Account, excess of receipts		\$2,649 05		\$2,171 54

The excess of receipts shown above, amounting to \$2,171.54, has been carried to the sinking fund as required by law.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 17,488 families, 600 stables, 1,839 horses, 98 cows, 166 shops, and 344 offices and stores, by the following fixtures, viz:—

20,474 faucets,	34 urinals,
7,475 wash basins,	8 yard hydrants,
10,687 wash tubs,	2 fountains,
7,001 bath tubs,	14 tumbler washers,
200 slop closets,	1,758 hand hose,
17,837 pan closets,	6 motors.
3 hopper closets,	

Also,

978 fire hydrants (beside 19 on private premises).
 8 fire reservoirs.
 28 drinking fountains in public squares.
 59 street watering standpipes.
 4 public sanitaries.

The above schedule of fixtures does not include those in school-houses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made with very satisfactory results.

Respectfully submitted,

WALTER H. HARDING,

Registrar.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1902.

Water rates unpaid November 30, 1901	\$438 34	
Expenses and repairs unpaid November 30, 1901	1,004 51	
Fees and on bills unpaid November 30, 1901	118 00	
Gas bills unpaid November 30, 1901	6 00	
Manufacturers bills unpaid November 30, 1901	283 91	
	<hr/>	\$1,860 76

and placed in the hands of the City
Treasurer for collection from Decem-
ber 1, 1901, to December 1, 1902

Water rates	\$222,345 99	
Off and on water	504 00	
Gas	111 25	
Boats	100 00	
Expenses and repairs	4 168 43	
Manufacturers bills	1,643 97	
Construction bills	877 13	
	<hr/>	\$230,740 68
Total bills		<hr/> \$241,730 82

have also been collected

Water rates	\$134,500 13	
Off and on water	646 00	
Boats and gas	168 00	
Gas	107 50	
Manufacturers account	1,343 30	
Construction account	769 50	
Expenses and repairs bills	2,049 15	
	<hr/>	\$233 645 90

have also been stated

Water rates, off and on, and scale exp- enses and repairs, and Construction account	<hr/>	\$5,905 08
---	-------	------------

There remains uncollected:—

Water rates	\$2,347 12	
Supplies and repairs	1,281 33	
Off and on	126 00	
Seals	9 25	
Maintenance account	465 88	
Construction account	77 68	
	<hr/>	\$4,307 21 \$341,738 82
Total bills for collection		\$341,738 82
Less abated	\$3,985 68	
Less refunded	3,000 00	
Less unpaid	4,807 21	
	<hr/>	\$11,292 84
Net receipts		\$330,445 98

Attest:

WALTER H. HARDING,
Registrar.

CAMBRIDGE, December 1902.

I have examined the accounts of the Water Registrar and find that they correspond in the amounts collected, abated, refunded and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor.

STILLMAN F. KELLEY,
Committee on Accounts.

STATEMENT OF THE CITY TREASURER.

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CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER,

December 1, 1902.

P. to Cambridge Water Board

SIR: I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1902.

Amount collected for account of Water Works, "Water Rates,"	
"Maintenance" and "Supply" Accounts	\$135,002 11
Amount collected for account of Water Works "Construction"	1,676 15
"Assessment" certificate received and paid on "Water Rates"	2,500 00
"Assessment" certificate have been presented, and paid to amount of	2,000 00
Amount paid to my hands Nov 30, 1902, for account of "Water	
Rates, "Maintenance" and "Supply" Accounts	4,239 88
Amount paid Nov 30, 1902, for account of "Construction"	77 00

Very respectfully,

W. W. DALLINGER,
City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM,
City Auditor.

REPORT OF THE SUPERINTENDENT OF WATER WORKS

CAMBRIDGE, December 4, 1902.

To the Honorable Water Board of the City of Cambridge:—

GENTLEMEN:—Complying with the City Ordinance, I herewith submit the twenty-eighth annual report of the Superintendent, for the year ending November 30, 1902.

	Gallons.
Total water pumped	2,980,553,545
Quantity of water sold by meter	940,768,200
Quantity of water used for sprinkling streets	80,907,175
Quantity of water used for flushing sewers	6,250,000
Quantity of water used for cleaning sanitaries	7,500,000
Quantity of water used for public buildings	39,804,500
Quantity of water used for drinking fountains	35,000,000
Quantity of water used for testing meters	57,500
	<hr/> 1,110,287,375

Number of gallons daily for each inhabitant on the total amount pumped, 85.27.

Number of gallons daily for each inhabitant on total amount used by domestic meters, and including water used for fire purposes, for flushing pipes, blowing off dead ends, puddling trenches and water used for hose and private stables, 54.24.

COMPARATIVE STATEMENT OF TOTAL PUMPING DURING THE PAST TEN YEARS.

Date.	Total Yearly Pumping.	Increase or Decrease.	Average Daily Pumping.	Increase or Decrease	Gallons to each inhabitant daily.
1893	2,234,863,924	273,501,164 increase	6,122,915	764,000 increase	74.50
1894	2,127,878,627	106,985,297 decrease	5,829,804	283,111 decrease	69.19
1895	2,190,781,892	62,903,265 increase	6,002,143	172,339 increase	71.65
1896	2,413,566,557	222,724,665 "	6,594,280	592,138 "	75.99
1897	2,441,340,196	27,833,639 "	6,888,603	94,323 "	76.48
1898	2,792,321,110	350,980,914 "	7,650,195	961,592 "	85.69
1899	2,882,570,430	90,249,320 "	7,897,453	247,258 "	87.16
1900	2,651,277,240	231,293,190 decrease	7,283,773	633,680 decrease	78.69
1901	2,785,156,440	133,879,200 increase	7,630,566	346,796 increase	80.57
1902	2,980,553,545	145,397,105 "	8,028,914	398,348 "	86.27

FRESH POND AND SURROUNDINGS.

The condition of the grounds, roads and walks about the Pond has been maintained as in past years; the care and propagation of plants and shrubs in the nursery has been continued.

The sale of plants this season has amounted to \$533.41; in addition to these a great quantity of shrubs, etc., has been used on the sections graded this year.

The appropriation of \$10,000.00 made for the park work about the Pond has been expended in continuing the grading on the the north and northwest sides of Concord and Huron Avenues. Work was begun September 2nd and continued until November 15th. This portion of the border of the Pond is now nearly completed, and with a few years' growth of the shrubbery it will form a very attractive section of the park system.

As in past years all standing grass not needed by the department has been sold.

The average height of the Pond has been 15.17 or .52 lower than last year; but in comparing these elevations the fact should be taken into consideration that the rainfall this year has been 2.89 less than that of last year.

A catch basin has been built on Huron Avenue near Concord Avenue.

FRESH POND RESERVOIR.

No.	Level at lowest level of water	Highest level of water	Monthly flow, cubic feet.	INFANT WATER			
				1 inch Opening		20 inch Opening	
				Opened	Closed	Opened	Closed
1	10 00	11 10	1 1	During entire month, 20 turns		During entire month, 20 in.	
2	10 10	11 20	1 2	During entire month, 20 turns		During entire month, 20 in.	
3	10 20	11 30	1 3	During entire month, 20 turns		During entire month, 20 in.	
4	10 30	11 40	1 4	During entire month, 20 turns		During entire month, 20 in.	
5	10 40	11 50	1 5	During entire month, 20 turns		During entire month, 20 in.	
6	10 50	12 00	1 6	During entire month, 20 turns		April 1 to 15, 20 in.	April 16
7	11 00	12 10	1 7	During entire month, 20 turns		April 16 to 30, 20 in.	
8	11 10	12 20	1 8	During entire month, 20 turns		During entire month, 20 in.	
9	11 20	12 30	1 9	During entire month, 20 turns		During entire month, 20 in.	
10	11 30	12 40	1 10	During entire month, 20 turns		During entire month, 20 in.	
11	11 40	12 50	1 11	During entire month, 20 turns		During entire month, 20 in.	
12	11 50	1 00	1 12	During entire month, 20 turns		During entire month, 20 in.	
13	12 00	1 10	1 13	During entire month, 20 turns		During entire month, 20 in.	
14	12 10	1 20	1 14	During entire month, 20 turns		During entire month, 20 in.	
15	12 20	1 30	1 15	During entire month, 20 turns		During entire month, 20 in.	
16	12 30	1 40	1 16	During entire month, 20 turns		During entire month, 20 in.	
17	12 40	1 50	1 17	During entire month, 20 turns		During entire month, 20 in.	
18	12 50	2 00	1 18	During entire month, 20 turns		During entire month, 20 in.	
19	1 00	2 10	1 19	During entire month, 20 turns		During entire month, 20 in.	
20	1 10	2 20	1 20	During entire month, 20 turns		During entire month, 20 in.	
21	1 20	2 30	1 21	During entire month, 20 turns		During entire month, 20 in.	
22	1 30	2 40	1 22	During entire month, 20 turns		During entire month, 20 in.	
23	1 40	2 50	1 23	During entire month, 20 turns		During entire month, 20 in.	
24	1 50	3 00	1 24	During entire month, 20 turns		During entire month, 20 in.	
25	2 00	3 10	1 25	During entire month, 20 turns		During entire month, 20 in.	
26	2 10	3 20	1 26	During entire month, 20 turns		During entire month, 20 in.	
27	2 20	3 30	1 27	During entire month, 20 turns		During entire month, 20 in.	
28	2 30	3 40	1 28	During entire month, 20 turns		During entire month, 20 in.	
29	2 40	3 50	1 29	During entire month, 20 turns		During entire month, 20 in.	
30	2 50	4 00	1 30	During entire month, 20 turns		During entire month, 20 in.	

PUMPING STATION AND GROUNDS

The engines and boilers are reported by the Chief Engineer to be in first-class condition, the new Engine No. 7 having done substantially as well as the past year.

The grounds about the station have received the usual care and attention.

The masonry of the pumping station should be painted the coming year and the conductors and gutters should be repaired.

PAYSON PARK RESERVOIR.

The south basin of the reservoir was cleaned out the early part of the season and the fence has been scraped and painted.

The grounds and buildings are in good condition.

No material change has occurred in the leakage from these basins.

PIPE YARD.

The woodwork of the shop and stable has been painted and a new fence has been built in front and alongside of the dwelling house.

The fence along Auburn Street has been repaired.

The dwelling house and sheds should be painted the coming year.

HIGH SERVICE.

Following is the list of streets supplied from the high service :—

Agassiz Street.	Holly Avenue.
Appleton Street, from Highland Street to beyond Hutchinson Street.	Humboldt Street.
Arlington Street.	Huron Avenue, from Appleton Street to Raymond Street.
Avon Hill Street.	Lancaster Street.
Bates Street.	Linnaean Street.
Bellevue Avenue.	Mount Pleasant Street.
Bellevue Avenue, west.	Raymond Street, from Linnaean Street to Walden Street.
Buena Vista Park.	Reservoir Street, from Highland Street.
Concord Avenue, from Huron Avenue to Buckingham Street.	Upland Road, from Richdale Avenue to Huron Avenue.
Garden Street, from Huron Avenue to Linnaean Street.	Vassal Lane, from Huron Avenue.
Highland Street, from Reservoir Street to Appleton Street.	Vincent Street.
Hillside Avenue.	Walnut Avenue.
	Washington Avenue.

LIST OF CHECK VALVES IN USE.

Appleton Street at Hutchinson Street.
 Avon Hill Street and Linnaean Street.
 Concord Avenue at Buckingham Street.
 Garden Street and Linnaean Street.
 Raymond Street and Linnaean Street.
 Upland Road near Mt. Vernon Street.
 Vincent Street at Walden Street.

LEAKAGE.

Twenty-three hundred thirty-nine (2,339) leaks have been reported and repaired this year. they were discovered as follows:

Ninety-six (96) on supplies in street.
 One (1) on forty inch check valve at Pumping Station
 One (1) on thirty-inch Muddy Brook main in Holworthy Street.
 One (1) on twenty-four inch main (pumping main) Lake View Avenue.
 One (1) on twenty-inch main in Craigie Square.
 One (1) on ten inch main
 Ten (10) on six inch mains
 Five (5) on four inch mains
 One (1) on siphon in Third Street.
 Five (5) on hydrants
 Two (2) on hydrant supplies
 Two (2) on fountains
 Five (5) on street watering stand-pipes
 One (1) on fire supply
 Five (5) on gates
 Twenty-two hundred two (2,202) on premises

Of the foregoing leaks on premises twenty-one hundred ninety-five (2,195) have been reported by our inspectors, they were discovered by them either on the annual canvass and reported as follows:

Sixteen hundred ninety-five (1,695) on water closets
 Five hundred thirty-nine (539) on faucets
 Twenty-six (26) on pipes
 Three (3) on sill cocks
 Twenty (20) on stop and wastes
 Twenty (20) on tanks.

Thirteen (13) leaks on supplies in street have been caused by electro-pneumatics on the pipe. the cost of repairs has as usual been charged to the Boston Elevated Railway Company

TABLE SHOWING A GAIN OR LOSS IN THE TOTAL CONSUMPTION
FOR THE YEAR 1902 OVER THE YEAR 1901.

	Total Consump- tion 1901.	Total Consump- tion 1902.	Increase or Decrease, + or —.
December	220,410,520	255,777,480	35,366,960+
January	239,847,080	269,265,480	29,418,400+
February	235,508,720	236,038,880	446,160+
March	222,808,960	231,112,200	8,303,240+
April	208,226,800	222,382,065	14,005,265+
May	207,740,720	240,431,400	32,690,680+
June	236,636,840	273,874,920	37,238,080+
July	255,524,280	256,684,120	1,159,840+
August	246,125,000	242,271,280	3,853,720—
September	231,464,200	232,555,840	1,091,640+
October	250,991,840	244,691,040	6,300,800—
November	229,687,480	224,918,760	4,768,720—
Total	2,785,156,440	2,990,563,545	145,397,105+

MAIN PIPE.

Ten thousand three hundred thirty-one and one-half (10,331½) feet of cast iron main pipe have been laid during the year; of this amount four thousand three hundred ninety (4,390) feet were used on extension in new locations and five thousand nine hundred forty-one and one-half (5,941½) feet were used in renewing pipe that had been in use for years and inadequately supplied the vicinity wherein located. The sizes were from four-inch to twelve-inch.

In Burns Court from Bradbury Street to Foster Street a new four-inch main has been laid to replace the old three-inch laid in 1868.

The construction of the sewer in Cambridge Street from Inman Square to Baldwin Street made it necessary to lay a new pipe to take the place of the old ten-inch pipe, laid in 1867, located on the north side of the street. Two thousand twenty-three (2,023) feet of twelve-inch and one hundred sixty-one (161) feet of ten-inch pipe were laid and connected to the twenty-four inch on the south side of Cambridge Street and also to all the cross streets. The location given for this pipe was the same as that occupied by the old twenty-inch cement pipe which it became necessary to remove before laying the new pipe. This made the expense of laying more than usual, but the old iron from the cement pipe was sold for \$291.58 on the street. The total cost of pipe, gates and connections, and the laying of same, was \$6,194.23.

In Charles Street from Sixth Street, west, ninety-six (96) feet of six-inch pipe has been laid to take the place of the old six-inch laid in 1891.

In Cogswell Place from Cogswell Avenue to Mead Street the old three-inch, laid in 1871 and 1872, has been discontinued and five hundred twenty-six (526) feet of four-inch laid in its place.

East Street from North Street to beyond Leighton Court is supplied by a new six-inch main two hundred nine (209) feet long; this locality was formerly cared for by a four-inch pipe which was laid in 1867.

The old four-inch in Hilliard Street from Brattle Street to Mount Auburn Street, laid in 1868 and 1869, has been removed; this district is now supplied by five hundred seventy-seven (577) feet of six-inch pipe.

Eighteen hundred fifty-seven and one-half (1857½) feet of six-inch has been laid in Mount Vernon Street from Massachusetts Avenue to Upland Road; the old four-inch pipe in this street has been discontinued, having been in use since 1868 and 1882.

In Oxford Street from Garfield Street to Beacon Street eight hundred seventy-six (876) feet of eight-inch pipe has been laid to take the place of the old eight-inch and six-inch pipes laid in 1870.

The table following will be found to contain the list of streets wherein pipes were extended and renewed.

In Erie Street from Bell Court to Waverly Street the six-inch main has been raised.

In Bell Street from Erie Street the four-inch main has been shut off and a small pipe laid to supply the building which is located over our four-inch main.

The twelve-inch main in Cambridge Street and the six-inch mains connecting the intersecting streets have been chained up during the construction of the new sewer.

The main pipe also in Sparks Street has been chained up at the request of the Sewer Department, which has built a new sewer in this street.

The annual inspection of the main pipes was made as usual this year under Assistant Superintendent Parker's supervision. It was carried on all night with results as satisfactory as in former years.

In response to the many requests of the consumers in various parts of the City the water has been blown off in the main pipes in the locations

specified; this was done in addition to the foregoing general inspection made by the Assistant Superintendent.

Two (2) new blow-off cocks have been placed in Saint Paul Street.

On March 8th a schooner while coming through the draw at Third Street bridge grounded and as the tide went out settled on the twelve-inch pipe and broke it. The water has been shut off on each side since that date and I would recommend that the siphon at Brookline Street bridge, which is not in use, be moved to Third Street. This would give us at that point a perfectly safe siphon under all possible conditions of traffic.

MAIN PIPE LAID, NUMBERS OF GATES AND FIRE HYDRANTS.

	IRON PIPE.		GATES.	HYDRANTS.
	Feet.	Size.	Size.	Kind.
Allston street, at Sidney street, east.....		inch.	inch.	
" " " " west.....			6	
" " " " " "			6	
Appleton street, opposite Brewster street.....	4	6		Chapman.
" " " " " "	7	6		Chapman.
Baldwin street, connection at Cambridge street.....	2	10		
" " " " " " corner Emmons place..	14	6		
Banks street, corner Flagg street.....				Flush.
Brattle street, between Channing and Lowell streets..				Chapman.
" " " " " " at Story street.....	7	6		Chapman.
Brewster street, near Riedesel avenue.....	4	6		Chapman.
Burns court, from Bradbury to Foster streets.....	253	4		
" " " " " " at Bradbury street.....			4	
Cambridge street, at Baldwin street, north.....			10	
" " " " " " st., from beyond Baldwin to Ellery street....	161	10		
" " " " " " st., at Fayette st. (cross connection).....	16	6		
" " " " " " street, opposite Fayette street.....				Chapman.
" " " " " " st., from Inman square to Ellery street.....	2,023½	12		
" " " " " " street, at Leonard avenue, north.....			12	
" " " " " " " " on hydrant.....	18	6		
" " " " " " st., at Maple avenue (cross connection).....	20	6		
" " " " " " " " north.....			12	
" " " " " " " " between Maple and Highland avenues....	7	6		Chapman.
Camella avenue, connection at Cambridge street.....	14	6		
Charles street, from Sixth street.....	96	6		
Chestnut street, extension toward Waverly street.....	54	4		
Cogswell place, from Mead st. to Cogswell ave.....	526	6		
" " " " " " avenue, at Mead street.....			6	
Columbia street, at Harvard street.....	7	6		Chapman.
Cottage Park avenue.....	84	4		
East street from North street to Leighton court.....	209	6		
Ellsworth avenue at Cambridge street.....	53	6		
Eric street, at Bell street.....			6	
" " " " " " from Bell to Sidney streets.....	390	6		
" " " " " " at corner Brookline street.....				Flush.
" " " " " " at Sidney street.....			6	
Fayerweather street, toward Vassal lane.....	258	8		
First street, corner Bent street.....	31n.	12		Chapman.
" " " " " " " " " "	9	6		
" " " " " " Rogers street.....	3	12		Chapman.
" " " " " " " " " "	9	6		
Forest street, at Garfield street.....			4	
Francis avenue, extension to Everett street.....	333½	4		
" " " " " " at Everett street.....			4	
Harris street, at Oxford street.....	50	6		
" " " " " " " " " "			6	

U. S. * PG * 111 NUMBER OF LISTS AND FIRE INCIDENTS (continued)

[illegible]

The sizes, lengths and weights of cast iron pipe laid are as follows :—

Size.	Length in Feet.	Weight in Tons.
12-inch	2,483½	110.44
10-inch	163	5.75
8-inch	1,789	38.34
6-inch	4,881½	62.59
4-inch	1,154½	9.79

SUPPLIES.

There have been one hundred sixty-one (161) supplies laid this year in new locations, making the total number laid to date, fourteen thousand five hundred and sixty-nine (14,569).

The account of the number and sizes of new supplies will be found in recapitulation table on page 42.

Four-inch supplies have been laid for Charles Wetmore on Bow Street and for Harvard College, Pierce Hall, on Oxford Street; and the Boston & Maine Railroad has required two large supplies; one of four-inch pipe in Sherman Street and one of six-inch pipe in East Street.

In addition to the foregoing large supplies we have laid eight (8) fire supplies as follows: A four-inch for George F. Blake Man'g Co. on Binney Street; a six-inch for Cambridge Electric Light Company on Western Avenue; a six-inch for the Cambridge Observatory, Harvard College; a six-inch for Little, Brown & Co. on Putnam Avenue; a six-inch for the National Biscuit Company on Franklin Street; two two-inch for P. G. Rice & Co. on Massachusetts Avenue and Lee Street; and one four-inch for University Associates on Massachusetts Avenue. Nine (9) supplies have been laid at the request and for the Sewer Department while constructing its sewers in several streets; as these were temporary supplies and have been removed, they were not included in the foregoing number.

Fifty-one (51) supplies have been furnished with sidewalk shut off boxes.

One hundred sixty-seven (167) supplies have been renewed as follows:

As the main pipes were renewed in the following named streets the supplies were renewed where necessary; five (5) in Burns Court; one (1) in Cambridge Street; seven (7) in Cogswell Place; five (5) in East

Street; eight (8) in Hilliard Street; (8) in Mt. Vernon Street; and (9) in Oxford Street. Fourteen (14) supplies have been renewed in River Street. As this street was to be paved to Kinnaird Street the service pipes were examined and in the above stated places were renewed in order that the surface of the street need not be disturbed for several years.

One hundred ten (110) supplies were renewed at the request of owners of premises.

Since the introduction of Stony Brook water the supply pipes throughout the City have filled up much more rapidly than before the connection to this source of supply, and I think that the trouble comes from the much softer water. As this trouble causes a large expense for the renewal of the supplies, and also the objectionable digging up of the streets, I would ask that something better than galvanized pipes be considered for supply pipes. I am aware that the first cost will be more, but the expense for a term of years will certainly be less, and we will not have the digging up of the streets for the purpose of renewing supplies.

Following is the list of establishments having fire protection from the City of Cambridge:—

American Rubber Co.,	Binney street,	Two 6-in.
American Net & Twine Co.,	Third street,	6-in.
American Vulcanized Rubber Co.,	Tannery street,	3-in.
Beecher Asphalt Paving Co.,	First street,	6-in.
Bay State Metal Works,	Harvard street,	6-in.
Blacker & Shepard,	Oakburn street,	3-in.
Blake, Geo. F., Manufacturing Co.,	Binney street,	3-in.
	Third street,	4-in.
Boston Book Binding Co.,	Mt. Auburn street,	6-in. & 4-in.
Boston Elevated Railway Co.,	Baldwin street,	2-in. & 4-in.
	Cambridge street,	Two 2-in.
	Pelham street,	Three 4-in.
	Massachusetts avenue,	4-in.
	Mt. Auburn street,	4-in. & 2 in.
	Murray street,	4-in.
	River street,	4-in.
Boston & Maine Railroad,	Bridge street,	4-in.
	Bridge street,	6-in.
	Prison Point street,	4-in.
Boston Woven Hose & Rubber Co.,	Portland street,	10-in. & 8-in.
Cambridge Gas Co.,	Third street,	6-in.
Cambridge Electric Light Co.,	Western avenue,	6-in.
Cambridge Mutual Fire Insurance Co.,	Massachusetts avenue,	2-in.
Chalmers Foundry Co.,	Portland street,	3-in.
Cover Manufacturing Co.,	Pleasant street,	6-in.
Croarty & Daly,	Massachusetts avenue,	4-in.

Ginn & Co.,	First street,	Two 6-in.
" "	Athenaeum street,	8-in.
Goepper Brothers,	Ninth street,	1 1-2-in.
Harvard College,	Harvard Union, Harvard st.,	4-in.
" "	Memorial Hall, Cambridge st.,	4-in.
" "	Observatory, Concord avenue,	6-in.
" "	Semitic Mus'm, Divinity ave.,	4-in.
Holy Ghost Hospital for Incurables,	Hovey avenue,	3-in.
Houghton, Mifflin & Co.,	Albro & Blackstone streets,	6-in.
" " "	River street,	6-in.
Irving & Casson,	Otis street,	6-in.
" "	Thorndike street,	6-in.
" "	Thorndike street,	2-in.
Ivers & Pond Piano Co.,	Albany street,	4-in.
Jones & Co., C. L.,	Pearl street,	4-in.
Keeler & Co.,	Thorndike street,	1-in.
Kendall, Edward, & Sons,	Main street,	2-in.
Lamb & Ritchie,	Albany street,	6-in.
Lever Bros. Limited (Boston Works),	Broadway,	6-in.
Little, Brown & Co.,	Putnam avenue,	6-in.
Lockhart, Wm. L., & Co.,	Bridge street,	1 1-2-in.
Luke, E. H., Estate of,	Main street,	2-in.
Mason & Hamlin Co.,	Broadway,	Two 6-in.
Massachusetts Athletic Ass'n,	Lansdowne street,	4-in.
Metropolitan Storage Warehouse Co.,	Massachusetts avenue,	6-in.
Middlesex C'ty, House of Correction,	Second & Spring streets,	6-in.
National Biscuit Co.,	Franklin street,	4-in.
" " "	Franklin street,	6-in.
" " "	Green street,	8-in.
National Linseed Oil Co.,	Fifth street,	6-in.
North Packing & Provision Co.,	Winsor street,	6-in.
O'Brien, John (Rev.),	Seventh street,	4-in.
Page, Geo. G., Box Co.,	Hampshire street,	6-in. & 4-in.
Peterson, Oscar G.,	483 Main street,	4-in.
Pierce, Thomas, Trustees of Est.,	Broadway,	6-in. & 4-in.
Pi Eta Club,	Winthrop street,	2-in.
Porter, Henry S.,	Kinnaird street,	4-in.
Reardon, John, & Sons, Corporation,	Waverly street,	4-in.
Reardon, William,	Portland street,	2-in.
Revere Sugar Refinery,	Water street,	6-in.
Reversible Collar Co.,	Putnam avenue,	6-in.
Russell, Lucy J.,	29 Elm street,	1 1-2-in.
Rice, P. G., & Co.,	Massachusetts ave. & Lee st.,	Two 2-in.
Sawyer, Howard M., & Son,	Thorndike street,	4-in.
Seavey Manufacturing Co.,	Third street,	6-in.
Seelye Manufacturing Co.,	First street,	4-in.
Simplex Electrical Co.,	Auburn street,	3-in.
" " "	Auburn street,	6-in.
" " "	Franklin street,	6-in.
Slavens, Luther R.,	Broadway,	2-in.
Sparrow, H. F., & Co.,	Hampshire street,	6-in.
Speare's, Alden, Sons & Co.,	Rogers street,	4-in.
" " " "	Sixth street,	4-in.
Standard Oil Co.,	Potter street,	6-in.
Standard Turning Works,	Main street,	2-in.
Thayer, Henry, & Co.,	Broadway,	6-in.

Water Cylinder, & Son,	Broadway,	4 in.
University Apparatus,	Linden street,	4 in.
	Massachusetts avenue,	4 in.
University Press,	Nutting place,	4 in.
Wormsley & Co.,	Claverly Hall, Mt. Auburn st.,	4 in.
Whitcomb Brothers,	Albany street,	4 in.

DRINKING FOUNTAINS

There has been no addition this year to the number of drinking fountains; there are twenty-eight (28) in use, of which four (4) are ice water drinking fountains.

The ice-water drinking fountains were supplied with ice from June 1 to September 30, inclusive, at a cost of four hundred sixty-one and nine tenths dollars (\$461.47), as follows: Central Square fountain, \$119.70; Lake Cambridge fountain, \$133.00; Harvard Square fountain, \$90.15; North Cambridge fountain \$98.62. An appropriation of five hundred dollars (\$500.00) was made by the City Council for this expenditure.

The fountains have been inspected and repaired as usual. Following is a list of those which have received more extended repairs: Brattle Square, Cambridge Field, Central Square, Inman Square, Kendall Square, North Square, Rindge Field, Sherman Square.

STREET WATERING STANDPIPES

As of date December 1, 1902 there are sixty-one (61) street watering standpipes in use.

Two have been added to the list this year as follows:

1. On Northland Street, corner of Trembridge Street, and on Rindge Avenue corner of Clifton Street, this standpipe was situated previous to its location on Lake View Avenue, but was not included in the list as it was not used for street sprinkling purposes.

The standpipe located at corner of Austin and School Streets has been found its final resting place at the corner of Winsor and State Streets. It has been relocated several times but has always been a source of annoyance to its neighbors.

At the corner of Broadway and South Street a new standpipe has been set to replace one that was broken.

In the following named streets the standpipes have been repaired: Brattle Square, Beach Street at Massachusetts Avenue, Bond Street at

Garden Street; Central Square; Massachusetts Avenue at Frank Street; Massachusetts Avenue at Hancock Street; Thorndike and Sixth Streets; River Street near Putnam Avenue; Waterhouse and Garden Streets; Winsor Street at Broadway; Winsor Street at Cambridge Street.

The Street Department has as in previous years reimbursed this department for the expense incurred in repairing the standpipes injured by frost.

GATES.

Thirty-nine (39) gates have been set this year. (See lists on page 42).

Fifteen (15) on extension of main pipes.

Fifteen (15) on renewal of main pipe.

Nine (9) on supplies.

The usual thorough examination of gates has been made, and their situation carefully located.

At Cambridge Street, corner of First Street, the gate has been raised.

In Prison Point Street one (1) eight-inch and one (1) one six-inch gates have been set to take the places of old ones. This work was done at the request of the Boston & Maine Railroad Company, and the cost of same has been charged to it.

BOXES.

The total number of boxes set during the year was one hundred eight (108).

Thirty-one (31) iron boxes have been set on extension and renewal work.

Thirty-one (31) special meter boxes have been set with meters.

Twenty-three (23) iron boxes have been set on new supplies.

Twenty-three (23) boxes have been set in place of worthless ones removed as follows: eighteen (18) iron; two (2) wooden; two (2) flush; and one (1) meter boxes.

In ten (10) locations the boxes have been lowered.

In nineteen (19) locations the boxes have been raised.

In seven (7) locations the boxes have been repaired, and

In one (1) location a gate box has been reset.

Outside of the usual examination of service boxes and the lowering or raising of same to sidewalk level, in one hundred ten (110) cases the service boxes have been lowered and in twenty-one (21) they have been raised, in two (2) cases they have been retained.

In Wright Street, on account of the widening of the street by the Street Department, the service boxes have been relocated; and on supplies not previously furnished new service boxes have been set.

HYDRANTS

There are one thousand one (1,001) hydrants in use at this date (December 1, 1907).

Eight and forty (40) posts, one (1) Boston, thirty-four (34) Coffin, three (3) Holyoke, and one (1) Perkins, have been used. (See table of Main Pipe Laid, etc., on page 42).

In posts and thirteen (13) flush have been removed as follows:

post from Banks Street, corner of Flagg Street; Holyoke

No. 10 Little Street, corner of Story Street (this hydrant was broken

Not listed post from Putnam Avenue, corner of Sands Street:

Lace from Portland Street, corner of Main Street; Perkins post

West, corner of Dunster Street: Perkins post from Tannery

this hydrant was broken by a team); and flush hydrants have

been removed from Allston Street, corner of Sidney Street; Baldwin Street, corner of Emmons Place; Cambridge Street, opposite Fayette Street; Cambridge Street, opposite Maple Avenue; Columbia Street, corner of Harvard Street; Erie Street, corner of Brookline Street; Harris Street, corner of Oxford Street; Harvard Street, corner of Clark Street; Harvard Street, corner of Moore Street; Hubbard Avenue, corner of Wallen Street; Norfolk Street, corner of Harvard Street; Somerset Street, corner of Pleasant Street; Sixth Street, corner of Gore Street.

Total number and kinds of hydrants in use are as follows :—

Boston	.	.	.	.	.	.	.	.	156
Chapman	.	.	.	.	.	.	.	.	514
Coffin	.	.	.	.	.	.	.	.	42
Flesh	.	.	.	.	.	.	.	.	108
Holyoke	.	.	.	.	.	.	.	.	88
Parkins	.	.	.	.	.	.	.	.	93
Total									1,001

The grades of hydrants in the following streets have been changed to conform to the surface elevation: Boylston Street opposite Eliot Street; Bridge Street; Dana Street between Broadway and Cambridge Street; Lake View Avenue at No. 107; Mount Auburn Street at Channing Street; Mount Auburn Street at Elmwood Avenue; Quincy Square; Sherman Street; Washington Avenue near Upland Road.

In the locations following the hydrants have been repaired: Bow Street at Plympton Street; Burleigh Street at Hastings Street; Cambridge Cemetery; Cedar Street at Harvey Street; Columbia Street at Broadway; Crescent Avenue near Hewes' pottery; Green Street at Bay Street; Green Street at Vernon Street; Hampshire Street at Elm Street; Harvard Street at Bigelow Street; Lee Street; Market Street at Columbia Street; Mount Auburn Street at Banks Street; Mount Auburn Street at Boylston Street; Mount Auburn Street at Lowell Street; Union Street; Walker Street; Washington Avenue.

At Blanche Street, corner of Massachusetts Avenue, the Chapman hydrant has been relocated.

In Prison Point Street the hydrants have been removed and relocated temporarily during the construction of the new street. So soon as this work is completed the hydrants will be set in permanent locations.

In Franklin Street the Chapman hydrant has been relocated at the expense of and for the accommodation of the National Biscuit Company.

The annual inspection of hydrants has been made.

METERS.

Two hundred fifty-four (254) meters have been set this year in new locations, as follows: Three (3) were set on police stations; thirty-six (36) were set on schoolhouses; sixteen (16) were set on churches; eight (8) were set on engine houses in various parts of the City; the remaining number, one hundred ninety-one (191) were set at the request of the property owners, or where in the judgment of the Water Board they were necessary, in order to prevent waste of water.

The sizes were as follows: One hundred twenty-seven (127) of five-eighths inch; sixty-seven (67) of three-fourths inch; forty-five (45) of one inch; eight (8) of one and one-half inch; four (4) of two inches; one (1) of three inches; one (1) of four inches; one (1) of six inches.

The number of meters now in use in the City is.

3 Ball & Peto	9 Thompson
61 Crown	664 Trident
2 Empire	54 Union Rotary
1 Glen	1 Weir
140 Horner	72 Worthington
64 Lambert	
13 Nash	2 113

STONY BROOK PIPE LINE.

The usual inspection of all the gates and air valves has been made the last year. The work of examining the line for leaks was continued this year with the result that in that portion of the line through Holworthy Street and Mount Auburn Street as far as Cottage Street in Waltham nearly every joint uncovered was found in a leaky condition.

owing to a change in grade of Pleasant Street in Watertown a portion of the main will have to be lowered the coming season. Work is now in progress on a portion west of Moody Street in Waltham where the pipe was laid on a filling and has settled.

The ejector placed on the summit of the main in Holworthy Street for the purpose of removing the air has been in operation during the whole of the year with, I think, very satisfactory results in the discharge from the line.

STONY BROOK

Two cesspools and one vault have been constructed the past year to care for drainage on the watershed of this brook, making a total of eighteen cesspools and nineteen vaults.

All cleaning of the same has been done by our outfit, it only being necessary to hire a double team when needed. The practice shows a material saving over previous years.

HOBBS BROOK

The twelve-inch drain which was under construction at the date of the last report has been finished and has removed all standing water from that portion of the filled land near Winter Street.

The condition of the meadows last winter being favorable, about fifteen thousand four hundred fifty (15,450) feet of ditching was done on the land about the upper portion of this basin. The ditches have been cleaned of all obstructions this fall, and are in good condition.

The usual cleaning up along the line of fences has been done, and all grass not needed has been sold standing.

RECAPITULATION.

	8 Inch	6 Inch	4 Inch	3 Inch	2 Inch	1½ Inch	1¼ Inch	1 Inch	¾ Inch	Total
Length, in feet, of pipe.....	24	183	191½	4	404½	125½	519½	1,477	8,905½	6,825½
Number of supplies.....		5	5		12	3	8	28	100	161
Number of stop and waste valves.....					11	4	6	25	94	140
Number of screw cocks.....					12	1	10	26	101	150
Number of sidewalk cocks.....					1		8	27	105	141
Number of service boxes.....										124
Number of gates.....		5	3	1						9
Number of gate boxes.....										28

MAIN PIPE.

	12 Inch	10 Inch	8 Inch	6 Inch	4 Inch	Total
Length, in feet, of pipe extension....	820	2	911	1,748½	908½	4,292
Length, in feet, of pipe renewals.....	2,023½	161	878	2,633	246	5,941½
Total length, in feet, of pipe.....	2,843½	163	1,789	4,381½	1,154½	10,533½
Number of gates.....	5	1	1	18	6	31
Number of hydrants..				43		43

TABLE SHOWING THE DAILY AVERAGE GALLONS, BY THE MONTH, FLOWING OVER THE WASTE WAY AT STONY BROOK.

	Gallons.	Number of Days.		Gallons.	Number of Days.
December, 1901....	735,900,000	23	June, 1902....	100,000	1
January, 1902....	905,000,000	31	July, 1902....		
February, 1902....	494,200,000	28	August, 1902....		
March, 1902....	2,788,700,000	31	September, 1902....		
April, 1902....	1,257,800,000	30	October, 1902....	15,700,000	3
May, 1902....	321,700,000	31	November, 1902....	7,000,000	4

Total amount wasted 6,539,100,000 gallons.

Total number of days in which water wasted 182

SUPERINTENDENT OF WATER WORKS.

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COMPARATIVE TRENCHING FOR THE PAST TEN YEARS.

	Extensions.	Renewals.	Supplies.	Total Feet.	Miles.
1893.....	18,890½	11,008	14,233½	43,022	8.26
1894.....	18,673	17,481½	17,311	48,265½	9.16
1895.....	11,063	15,638½	22,390	48,987½	9.27
1896.....	17,621	26,048	17,861	61,025	11.55
1897.....	11,268	36,867½	16,131½	64,257	12.19
1898.....	11,045½	25,397	12,186	48,628½	9.21
1899.....	11,061½	9,427½	13,486½	33,965½	6.48
1900.....	9,174	412½	6,846	16,434½	3.11
1901.....	4,126	5,750	8,346	18,122	3.43
1902.....	4,392	5,941½	6,885½	17,169	3.25

Accompanying this will be found the report of the Chief Engineer of the Pumping Station.

All of which is respectfully submitted,

E. C. BROOKS,

Superintendent.

REPORT OF THE PUMPING ENGINEER

PUMPING STATION, CAMBRIDGE, MASS.,

December 1, 1902

W. LEWIS C. BRIGGS, Supt.

SIR: I would report the machinery and boilers at the pumping station in first-class condition.

The Leavitt Engine No. 7, continues to run very satisfactorily, pumping 90 per cent of all the water used by the City the past year, at very little expense for repairs.

The coal used the last half of the year has been very inferior in quality and has considerably reduced the average duty for the year.

Respectfully submitted,

E. I. HARRIS

OPERATING EXPENSES AT PUMPING
STATION.

Coal	\$7,876.31
Express	8.75
Ice	15.30
Oil, grease and packing	429.30
Repairs on engines	135.33
Repairs on boilers	93.40
Repairs on buildings	127.11
Telephone	75.62
Tools and hardware	69.88
Miscellaneous	65.28
Salaries	7,303.72
	<hr/>
	\$16,200.00

SUMMARY OF STATISTICS

FOR THE YEAR ENDING NOVEMBER 30, 1902.

In form recommended by the New England Water Works Association.

CAMBRIDGE WATER WORKS,

CITY OF CAMBRIDGE, COUNTY OF MIDDLESEX, STATE OF MASSACHUSETTS.

GENERAL STATISTICS.

Population by census 1900 — 91,886.

Date of construction — 1855.

By whom owned — City of Cambridge.

Source of supply — Hobbs and Stony Brooks in Lincoln, Waltham and Weston, and Fresh Pond in Cambridge.

Mode of supply (whether gravity or pumping) — Gravity from Hobbs and Stony Brook to Fresh Pond, pumping from Fresh Pond to Payson Park Reservoirs, thence to consumers by gravity.

PUMPING STATISTICS.

1. Builders of pumping machinery — One Leavitt, built by Groshon High Duty Pumping Engine Company ; two Worthington ; one Blake.

2. Description of fuel used — *a.* Kind — bituminous.

b. Brand of coal — Cumberland.

c. Average price of coal per gross ton, delivered, contract May, 1902, \$4.30 ; contract, October, 1902, \$8.50.

3. Coal consumed for the year — 4,097,200 lbs.

4. (Pounds of wood consumed) \div 3 = equivalent amount of coal, 500 lbs.

5. Total equivalent coal consumed for the year = (3) + (4), 4,097,700 lbs.

6. Total pumpage for the year — 2,930,553,545 gallons, without allowance for slip.

- Average static head against which pumps work 158.03 feet.
- Average dynamic head against which pumps work — 194.44 feet
- Number of gallons pumped per pound of equivalent coal (5), 715
- Total — gallons pumped $\div 100$ (the $\div 100$ dynamic head (6)) — 115 974,368 4
- Total feet consumed (5)
- Cost of pumping, figured on pumping station expenses, viz., \$16,300
- Per million gallons pumped \$5.53
- Per million gallons raised one foot (dynamic) — \$.028

• Low duty engines were run 171 hours during year.

FINANCIAL STATISTICS FOR YEAR 1902

RECEIPTS.		
non-recurrent receipts		\$1,583 30
non-fixed rates	\$194,466 70	
non-meter rates	132,000 00	
	<hr/>	326,466 70
non-fixed charges		19,224 65
non-supplies	3,850 00	
non-fuel and on supplies and rent	763 00	
non-mat. material	749 50	
	<hr/>	5,362 50
		<hr/>
		\$352,637 15

EXPENDITURES		
operation management and repairs)		\$59,943 64
fuel		1,300 00
oil		461 47
non-fuel work		9,996 83
charged on boats		129,579 00
maining fund		120,828 75
consumption of services		2,353 23
consumption of mains		13,970 34
consumption of motors		3,028 80
fixed work construction		5,947 60
		<hr/>
		\$347,311 68

SUMMARY OF STATISTICS.

Net cost of works to date	\$5,724,301 60
Bonded debt at date	3,350,600 00
Value of Sinking Fund at date	
Average rate of interest	3½ and 4 per cent.

STATISTICS OF CONSUMPTION OF WATER.

1. Estimated total population at date — 94,152.
2. Estimated population on lines of pipe — 94,152.
3. Estimated population supplied — 94,152.
4. Total consumption for the year — 2,930,553,545 gallons.
5. Passed through meters — 940,768,200 gallons.
6. Percentage of consumption metered — 32.
7. Average daily consumption — 8,028,914 gallons.
8. Gallons per day to each inhabitant — 85.27 on total amount pumped.
9. Gallons per day to each inhabitant on domestic pumpage — 105.27.
10. Gallons per day to each tap — 551.
11. Cost of supplying water, per million gallons, figured on maintenance \$25.24.
12. Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds, \$69.47.

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

- Kind of pipe — cast iron.
- Sizes — From 2-inch to 40-inch.
- Extended 4,392 feet during year.
- a.—Discontinued 5,941½ feet during year.
- b.—Renewed 5,941½ feet during year.
- Total now in use — 125.12 miles.
- Cost of repairs per mile — \$1.23.
- Number of leaks per mile — .017.
- Length of pipes less than 4 inches diameter — 3.26 miles.
- Number of hydrants added during year — 23.
- Number of hydrants (public) now in use — 1,001.
- Number of stop gates added during year — 39.
- Range of pressure on mains — 45 lbs. to 55 lbs.

SUMMARY OF STATISTICS

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SERVICES

Kind of pipe — galvanized iron.
 Size — three fourth inch to two inches
 Quantity — 6,825 feet
 Total cost — \$11,115.00
 Number of service taps added during year — 161
 Number of meters — 14,500
 Average length of service — 41 feet
 Average cost of service for the year — \$17.40
 Number of meters added — 254
 Number of meters removed — 2,114
 Percentage of services metered — 15 per cent
 Percentage of receipts from metered water, 44 per cent

The following statement is from the report of the Commissioners of the Sinking Fund of the City of Cambridge, and shows the present condition of the Water Loan Sinking Fund :—

Dr.

The amount of the Fund, November 30, 1901, was . . \$757,731 54

Received during the year as follows :—

From the Treasurer of the City of Cambridge, the annual required appropriation from the water rates, including surplus, viz.	123,000 29	
From interest on investments	28,933 82	
	<hr/>	\$909,665 65

Cr.

Amount paid for accrued interest on investments purchased	606 17	
Amount paid for premiums on investments purchased	1,423 50	
Leaving the amount of the Fund, November 30, 1902	907,635 98	
	<hr/>	\$909,665 65

FRANK A. ALLEN,	} <i>Commissioners of the Sinking Fund of the City of Cambridge.</i>
JOHN C. BULLARD,	
GEORGE H. HOWARD,	
ANDREW J. LOVELL,	
J. HENRY RUSSELL,	
DANA W. HYDE,	

The following are the investments belonging to the Water Loan Funds :—

Cambridge	City bonds	3 1-2s, Matur'g Nov. 1, 1912	\$20,000 00
"	" "	4s, " Feb. 1, 1913	2,000 00
"	" "	4s, " Oct. 1, 1916	65,100 00
"	" "	3 1-2s, " Dec. 1, 1917	40,000 00
"	" "	3 1-2s, " Nov. 1, 1919	20,000 00
"	" "	4s, " Nov. 1, 1920	5,000 00
<i>Amount carried forward,</i>			<hr/> \$102,100 00

COMMISSIONER OF SINKING FUNDS.

53

Amount brought forward					\$122,100 00
1900	City bonds	60	Maturing	Jan. 1, 1900	\$10,000 00
Waltham	Town	60		Oct. 1, 1900	1,000 00
South Lee	-	\$12,100		Apr. 1, 1900	20,000 00
Providence, R. I.	City	20		July 1, 1900	20,000 00
Bell	Town	\$1-20		Sept. 14, 1900	2,300 00
Waltham	-	60		Oct. 1, 1900	6,000 00
Needham	City	60		Nov. 1, 1900	1,000 00
Town & Y	-	\$1-20		Nov. 12, 1900	2,000 00
Waltham	Town	60		Oct. 1, 1901	6,000 00
Needham	City	60		Nov. 1, 1901	1,000 00
Town & Y	-	\$1-20		Nov. 12, 1901	2,000 00
Belmont	Town	60		May 1, 1902	1,000 00
Belmont	-	60		Aug. 1, 1902	10,000 00
Needham	-	\$1-20		Oct. 12, 1902	6,000 00
Needham	City	60		Nov. 1, 1902	1,000 00
Town & Y	-	\$1-20		Nov. 12, 1902	2,000 00
West Springfield	Town	\$1-20		Dec. 1, 1902	12,000 00
New Bedford	City	\$1-20		Feb. 1, 1903	10,000 00
Needham	Town	60		Aug. 1, 1903	15,000 00
Needham	-	\$1-20		Oct. 12, 1903	6,000 00
Needham	City	60		Nov. 1, 1903	1,000 00
Town & Y	-	\$1-20		Nov. 12, 1903	2,000 00
Taunton	-	\$1-20		June 1, 1910	21,000 00
Quincy	-	60		July 1, 1904	6,000 00
Needham	Town	\$1-20		Oct. 12, 1910	6,000 00
Town & Y	City	\$1-20		Nov. 12, 1910	2,000 00
Taunton	-	\$1-20		June 1, 1911	20,000 00
Needham	Town	\$1-20		Oct. 12, 1911	12,000 00
Needham	City	\$1-20		Nov. 1, 1911	12,000 00
Town & Y	-	\$1-20		Nov. 12, 1911	2,000 00
New Bedford	-	\$1-20		Mar. 1, 1912	15,000 00
Providence	-	\$1-20		Apr. 1, 1912	10,000 00
Providence	-	\$1-20		July 1, 1912	20,000 00
Waltham	Town	60		Oct. 1, 1912	1,000 00
Town & Y	City	\$1-20		Nov. 12, 1912	2,000 00
-	-	\$1-20		Nov. 12, 1913	2,000 00
-	-	\$1-20		Nov. 12, 1914	2,000 00
1915	-	60		Jan. 1, 1915	14,000 00
Weymouth	Town	\$1-20		May 1, 1915	2,300 00
Town & Y	City	\$1-20		Nov. 12, 1915	2,000 00
Weymouth	Town	\$1-20		May 1, 1916	2,300 00
Waltham	-	60		Mar. 1, 1917	2,000 00
Waltham	City	60		Apr. 1, 1917	24,000 00
Weymouth	Town	\$1-20		May 1, 1917	2,300 00
Barnstable, Ma.	City	60		Jan. 1, 1918	15,000 00
Waltham	Town	60		Mar. 1, 1918	1,000 00
Weymouth	-	\$1-20		May 1, 1918	2,300 00
-	-	\$1-20		May 1, 1919	2,300 00
-	-	\$1-20		May 1, 1920	2,300 00
Providence Share Life & R. Co.	-	60		Aug. 1, 1920	25,000 00
Providence R. & Co.	-	\$1-20		Oct. 1, 1920	20,000 00
Quincy	City bonds	60		May 1, 1921	2,000 00
-	-	60		May 1, 1922	1,000 00
Amount carried forward					\$254,000 00
					\$376,100 00

COMMISSIONER OF SINKING FUNDS.

<i>Amount brought forward</i>						\$676,900 00
Quincy	City bonds	4s,	Maturing	May 1, 1925	\$2,000 00	
"	" "	4s,	"	May 1, 1926	3,000 00	
"	" "	4s,	"	May 1, 1927	3,000 00	
Attleborough	Town "	4s,	"	July 1, 1927	10,000 00	
Quincy	City "	4s,	"	May 1, 1928	3,000 00	
Winchester	Town "	4s,	"	June 1, 1928	6,000 00	
Quincy	City "	4s,	"	May 1, 1929	3,000 00	
Fall River	" "	3 1-2s,	"	Nov. 1, 1929	75,000 00	
Quincy	" "	4s,	"	May 1, 1930	3,000 00	
"	" "	4s,	"	May 1, 1931	3,000 00	
"	" "	4s,	"	May 1, 1932	1,000 00	
Newton	" "	4s,	"	Aug. 1, 1935	2,000 00	
"	" "	4s,	"	July 1, 1936	11,000 00	
Grafton	Town "	3 1-2s,	"	July 1, 1937	1,000 00	
Old Colony R. R. Co.		4s,	"	Jan. 1, 1938	25,000 00	
Grafton	Town bonds	3 1-2s,	"	July 1, 1938	2,000 00	
"	" "	3 1-2s,	"	July 1, 1939	2,000 00	
						<u>155,000 00</u>
						<u>\$831,900 00</u>
Cash in bank						<u>75,735 24</u>
						<u>\$907,635 24</u>

The Bonded Water Debt, which the foregoing Fund is to pay matures as follows:—

Nov. 1, 1906	3 1-2s	\$43,000 00
Oct. 1, 1907	4s	90,000 00
Nov. 1, 1907	4s	22,000 00
July 1, 1908	4s	46,000 00
Aug. 1, 1908	4s	25,000 00
July 1, 1909	4s	20,000 00
May 1, 1910	4s	288,000 00
July 1, 1910	4s	75,000 00
Sept. 1, 1910	4s	125,000 00
Jan. 1, 1911	4s	20,000 00
Oct. 1, 1911	4s	35,000 00
Jan. 1, 1912	4s	150,000 00
May 2, 1912	4s	75,000 00
Nov. 1, 1912	4s	45,000 00
Feb. 1, 1913	4s	100,000 00
Aug. 1, 1913	4s	50,000 00
April 1, 1915	4s	200,000 00
Aug. 1, 1915	4s	200,000 00
April 1, 1916	4s	100,000 00
July 1, 1916	4s	200,000 00
Aug. 1, 1916	4s	100,000 00
Oct. 1, 1916	4s	265,100 00
April 1, 1917	3 1-2s	200,000 00
July 1, 1917	3 1-2s	100,000 00
Nov. 1, 1917	3 1-2s	75,000 00
<i>ried forward</i>		<u>\$2,649,100 00</u>

COMMISSIONER OF SINKING FUND.

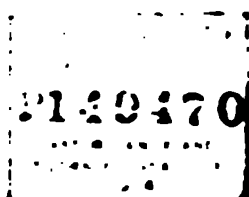
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Amount brought forward

\$2,642,100 00

Jan 1 : 1897	31-36		
May 2 : 1898	31-36	101,000 00	
Oct 1 : 1898	31-36	20,000 00	
Nov 1 : 1898	31-36	60,000 00	
Dec 1 : 1898	31-36	20,000 00	
Jan 1 : 1899	31-36	22,000 00	
Feb 1 : 1899	31-36	20,000 00	
Mar 1 : 1899	31-36	20,000 00	
Apr 1 : 1899	31-36	15,000 00	
May 1 : 1899	31-36	2,000 00	
June 1 : 1899	31-36	20,000 00	
		<u>701,000 00</u>	
			\$2,343,100 00

Annual Report



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City of Cambridge

MASSACHUSETTS

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City of Cambridge
Massachusetts

ANNUAL REPORT

OF THE

WATER BOARD

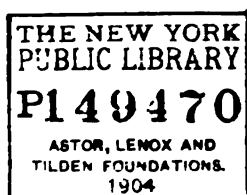
FOR THE

YEAR ENDING NOVEMBER 30, 1903



PRINTED FOR THE DEPARTMENT

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CAMBRIDGE WATER BOARD

1904

President

WILLIAM B. DURANT

Members of the Board

EDMUND M. STEVENS	Term expires 1904
JOHN C. HOWARD	Term expires 1905
WILLIAM B. DURANT	Term expires 1906
ALFRED A. LEADY	Term expires 1907
JAMES C. GREEN	Term expires 1908

WALTER H. HARDING, Clerk

Superintendent of Works

EDWIN C. BROOKS

Water Registrar

WALTER H. HARDING

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1865-1903.

CHESTER W. KINGSLEY	1865-1894
JOHN SARGENT	1865-1871
A. K. P. WELCH	1865-1871
ROBERT DOUGLASS	1865-1871
SAMUEL SLOCOMB	1865-1876
Z. L. RAYMOND	1871
HENRY L. EUSTIS	1871-1885
J. WARREN MERRILL	1871-1881
GEORGE P. CARTER	1871-1883
JOHN H. LEIGHTON	1876-1879
KNOWLTON S. CHAFFEE	1879-1889
JAMES M. W. HALL	1881-1899
LEANDER M. HANNUM	{ 1883-1884 1885-1893
JOHN F. O'BRIEN	1884-1895
GEORGE H. HOWARD	1889- (Now in Office.)
E. BURT PHILLIPS	1893-1896
FRANK A. ALLEN	1895-1899
EDMUND H. STEVENS	1899- (Now in Office.)
WILLIAM B. DURANT	1899- (Now in Office.)
ANDREW J. RADY	1903- (Now in Office.)
JOHN F. O'BRIEN	1903- (Now in Office.)

Presidents of the Board

J. WARREN MERRILL	1865-1867
ERZA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-

REPORT OF THE CAMBRIDGE WATER BOARD

CAMBRIDGE, December 15, 1903.

To the Honorable, the City Council of the City of Cambridge:—

The thirty-sixth annual report of the Cambridge Water Board for the year ending November 30, 1903, is herewith submitted for your consideration.

The different reservoirs of the City, at Hobbs Brook, Stony Brook and Payson Park, are all in good condition, as are all the works under the charge of the Board with the exception of the main supply pipe from Stony Brook, and the grounds around Fresh Pond, the improvement of which was discontinued this year, owing to the declination of the City Council to make the extra appropriation necessary for that purpose, which has been made for several years. The main supply pipe, and its condition, will be considered later in this report.

There are only two unsettled claims for land damages now pending, namely, one for land taken at Payson Park Reservoir from the Payson Park Trustees, and the other for land taken from Reuben Wyman at Edith Brook basin. The former is now in the course of settlement, and will probably be finally disposed of in a very short time. The latter is the subject of a suit in the Superior Court, and negotiations are now pending for its settlement.

FINANCIAL STATEMENT IN BRIEF.

The total cost of the Water Works to November 30, 1902, was	\$5,724,301 00
There was expended during the year on Construction Account	26,953 55
So that the total cost to November 30, 1903, was	\$5,750,255 15

WATER BOND ACCOUNT.

The whole amount of bonds outstanding is	\$1,338,000 00
Deducting from this sum the present value of the Water Debt	
Sinking Fund, exclusive of the note of the City for \$200,000	1,082,821 46
Leaves as the net Water Debt	\$2,597,178 34
For further details of the financial condition of the department, reference may be made to the statement of the Registrar appended to this report. From that statement it appears that the excess of receipts over expenditures during the past year is the sum of	
	\$1,025 42
The net water debt November 30, 1902, was	\$2,445,964 02
" " " 1903, "	2,387,178 34
Reduction of net debt during the year	\$58,785 68

WATER BOARD.

FRESH POND.


In making up the annual estimates for the past year, the Board recommended an appropriation of ten thousand dollars for the purpose of completing some of the unfinished work around the Pond, especially the portion of Kingsley Park adjacent to the south side of the Pond, which has long been in a rough and unsightly condition. The City Council refused to make the appropriation and consequently nothing could be done. It seems to the Board to be short-sighted policy to neglect the improvement of the grounds around the Pond, for the sake of a temporary saving in the expense. Since the park development was begun in 1896, all the expense has been paid for out of surplus water receipts, and none from the issue of bonds. The Board trust that they will no longer be compelled, for lack of funds, to neglect this work, and recommend a suitable appropriation for the ensuing year, so that the work may be resumed in the spring or fall.

WATER BASINS.

The water in Hobbs Brook and Stony Brook basins remains at about the usual level, but the water in Fresh Pond is now 5.31 feet below high water mark, and only about 2.55 feet above the level of the intake pipe. In view of the increasing consumption of water, and the specially large consumption which is always a feature of cold weather, and for other reasons hereinafter set forth, the Board have taken precaution to prevent a water famine by causing a connection to be made with the pipe of the Metropolitan Water and Sewerage Board, who have consented to supply the City temporarily, in case of sudden need. The connection has been made with the pipe where it crosses the Common, in order to avoid disturbing the surface of any street. A Venturi meter has been connected with the pipe so that the water supplied may be accurately measured and paid for according to the quantity consumed. The Board acknowledge with gratitude the courtesy of the Metropolitan Water and Sewerage Board, in lending their aid to provide for the emergency which confronts the City.

STONY BROOK OVERFLOW.

The overflow at Stony Brook dam this year shows a considerable decrease, as compared with that of the year preceding, in spite of a larger rainfall this year.



in overflow for the year ending December 1,	
1902, was	6,539,100,000 gallons.
in overflow for the year ending December 1,	
1903, was	6,437,500,000 "
Decrease	101,600,000 gallons

This fact has no special significance, however, and the decrease has in connection with the increasing consumption of water in the City, as the main supply pipe from Stony Brook has delivered substantially the same quantity of water at Fresh Pond in both years.

CHEMICAL EXAMINATION OF WATER FROM FRESH POND. —
AVERAGES BY YEARS.

	Parts per 100,000.			
	Free Ammonia.	Chlorine.	Nitrogen as Nitrate. Nitrite.	
1902 . . . . .	.0045	.55	.0309	.0004
1903 . . . . .	.0047	.59	.0241	.0003
Average for past ten years . . . . .	.0050	.61	.0269	.0004

RAIN-FALL.

The annual rain-fall for the past ten years at Fresh Pond is as follows:—

	Inches.
1894	35.85
1895	47.12
1896	38.82
1897	42.53
1898	52.42
1899	37.28
1900	46.89
1901	46.20
1902	43.31
1903	44.23
Average	43.46

The rain-fall for the year at Hobbs Brook was 47.42 inches; at Stony Brook, 45.97 inches.

From this table it will be seen that the year 1904 is likely to be a dry year.

pipe, Mr. Coffin estimates that the supply will run short about July or August, 1904, if the next year is a very dry one, otherwise in the summer of 1905. In case of success, there will only be time enough to lay the new pipe without undue haste, before the consumption of water outruns the supply. This is the opinion of Mr. Coffin, as well as the judgment of the Board.

After considering with care the statements, and the results of the researches of Mr. Coffin, the Board have recommended the City Council to pass an order, authorizing the Mayor to petition the Legislature for authority to issue water bonds to the amount of five hundred thousand dollars, for water works construction, so that the contracts may be made for a new pipe line, as soon as the surveys shall have been made. There should be no delay in considering and passing such an order, as the rules of the Legislature require that the petition should be presented before the first Wednesday of February next.

In order that the City Council may have all possible information at its command, the Board have caused the elaborate report of Mr. Coffin to the Water Board to be printed in full, and annexed hereto. It is not necessary that the Board should attempt to add anything to that report, as it contains the fullest possible information and it is hoped that the City Council will give it careful attention.

The suggestion is sometimes made, that Cambridge should enter the Metropolitan system, as an alternative to the development of its own resources. That such an alternative should not now be considered, is fully demonstrated, by Mr. Coffin in his report, to which reference is made for further particulars.

In 1898 the average daily consumption was 7,650,195 gallons. The report to the Water Board for that year, contains this prediction: "When the daily consumption amounts to 8,500,000 gallons, the capacity of our present delivery pipe connecting Stony Brook with Fresh Pond will have reached its limit, and another pipe should be laid large enough, with the present pipe, to keep Fresh Pond full, and equal to any future demands of our water takers, and equal to the largest daily supply which our Stony Brook system is capable of furnishing." That time is now at hand and the need of immediate action is urgent, for the daily average consumption has reached the amount of 8,659,463 gallons.

The Board have done all that is in their power, in presenting the facts, and need not your prompt action. Until you act, the Board is ~~not~~ and the responsibility is yours.

Respectfully submitted,

WILLIAM B. DURANT,
GEORGE H. HOWARD,
JOHN F. O'BRIEN,
ANDREW J. RADY,
EDMUND H. STEVENS.

Chicago Water Board.

Statement of yearly revenue received from water rates since the purchase of the works by the City :—

From April 28, 1865, to December 1, 1865	\$32,367 19
From December 1, 1865, to December 1, 1866	40,073 27
From December 1, 1866, to December 1, 1867	53,733 63
From December 1, 1867, to December 1, 1868	\$63,747 42
From December 1, 1868, to December 1, 1869	76,149 30
From December 1, 1869, to December 1, 1870	92,605 95
From December 1, 1870, to December 1, 1871	111,782 65
From December 1, 1871, to December 1, 1872	127,201 30
From December 1, 1872, to December 1, 1873	146,117 32
From December 1, 1873, to December 1, 1874	153,634 27
From December 1, 1874, to December 1, 1875	138,880 37
From December 1, 1875, to December 1, 1876	179,166 76
From December 1, 1876, to December 1, 1877	154,843 59
From December 1, 1877, to December 1, 1878	157,443 91
From December 1, 1878, to December 1, 1879	164,681 90
From December 1, 1879, to December 1, 1880	173,325 49
From December 1, 1880, to December 1, 1881	170,062 73
From December 1, 1881, to December 1, 1882	177,430 80
From December 1, 1882, to December 1, 1883	179,361 89
From December 1, 1883, to December 1, 1884	161,526 27
From December 1, 1884, to December 1, 1885	185,544 36
From December 1, 1885, to December 1, 1886	199,404 43
From December 1, 1886, to December 1, 1887	204,748 64
From December 1, 1887, to December 1, 1888	211,156 27
From December 1, 1888, to December 1, 1889	221,124 70
From December 1, 1889, to December 1, 1890	231,116 32
From December 1, 1890, to December 1, 1891	227,054 53
From December 1, 1891, to December 1, 1892	237,527 08
From December 1, 1892, to December 1, 1893	242,219 78
From December 1, 1893, to December 1, 1894	250,032 71
From December 1, 1894, to December 1, 1895	268,813 62
From December 1, 1895, to December 1, 1896	281,030 00
From December 1, 1896, to December 1, 1897	291,457 62
From December 1, 1897, to December 1, 1898	297,129 78
From December 1, 1898, to December 1, 1899	302,569 00
From December 1, 1899, to December 1, 1900	319,479 37
From December 1, 1900, to December 1, 1901	320,468 01
From December 1, 1901, to December 1, 1902	323,500 53
From December 1, 1902, to December 1, 1903	333,777 34

There has been abated :—

Water rates, off and on, and seals, supplies and repairs, and Construction account	\$3,756 45
---	------------

There remains uncollected :—

Water rates	\$4,622 73
Supplies and repairs	769 45
Off and on	130 00
Seals	10 00
Maintenance account	600 96
Construction account	269 33
	<hr/> \$358,664 77

EXPENDITURES.

Construction (General account)	\$26,353 55
Maintenance (General account)	64,289 51
	<hr/> \$90,643 06

ABATEMENTS.

Water rate, and supply and repair bills to the amount of	\$3,756 45
--	------------

REFUNDS.

Water rates to the amount of	\$3,169 06
Which amount deducted from receipts	336,946 40
	<hr/>
Leaves net receipts for water	\$333,777 34
Add off and on, fines, rents, seals and Maintenance account	1,571 10
	<hr/>
Makes net receipts of rates, fines, etc.	\$335,348 44

OFF AND ON.

Water has been shut off for non-payment of rates, or per order on account of vacancy, and seals have been applied to fixtures by request of owners, as follows :—

Water shut off in 1903	684
Supplies let on, shut off in 1903	517
Supplies let on, shut off in previous years	98
New supplies let on	136
Seal locks applied to fixtures in 1903	738
Seal locks removed, put on in 1903	385
Seal locks removed, put on in previous years	364

The excess of receipts in 1903 as shown above, amounting to \$1,923.28, has been carried to the sinking fund as required by law.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 17,811 families, 619 stables, 1,857 horses, 95 cows, 173 shops, 381 offices and stores, by the following fixtures, viz: —

20,585 faucets,	34 urinals,
7,516 wash basins,	7 yard hydrants,
10,787 wash tubs,	1 fountain.
7,005 bath tubs,	18 tumbler washers.
186 slop closets,	1,918 hand hose,
17,968 pan closets,	6 motors.
4 hopper closets,	

Also,

1,005 fire hydrants (beside 19 on private premises).
 8 fire reservoirs.
 28 drinking fountains in public squares.
 62 street watering standpipes.
 4 public sanitariums.

The above schedule of fixtures does not include those in schoolhouses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made with very satisfactory results.

Respectfully submitted,

WALTER H. HARDING,
Registrar.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1903

Collected November 30, 1902 :—

Water rates	\$2,547 12
Supplies and repairs	1,281 23
Off and on	126 00
Seals	9 25
Maintenance account	465 88
Construction account	77 63
	<u>\$4,507 21</u>

Bills placed in the hands of City Treasurer for collection from December 1, 1902, to December 1, 1903 :—

Water rates	\$348,940 51
Off and on water	645 00
Seals	114 50
Rent	168 00
Supplies and repairs	3,748 62
Maintenance bills	821 26
Construction bills	5,919 15
	<u>\$359,357 56</u>
Total bills	<u>\$358,064 77</u>

There has been collected :—

Water rates	\$334,946 40
Off and on ledger	620 00
Rent ledger	168 00
Seals	115 75
Maintenance account	663 25
Construction account	5,727 88
Supply and repair bills	4,200 50
Total collections	<u>\$346,540 83</u>

There has been abated :—

Water rates, off and on, and seals, supplies and repairs, and Construction account	\$3,756 45
--	------------

STATEMENT OF THE WATER REGISTRAR.

There remains uncollected :—

Water rates	\$4,622 73		
Supplies and repairs	769 45		
Off and on	130 00		
Seals	10 00		
Maintenance account	600 96		
Construction account	269 83		
		\$6,402 47	\$358,664 77
Total bills for collection		\$358,664 77	
Less abated	\$3,756 45		
Less refunded	3,169 06		
Less unpaid	6,402 47		
		\$13,327 98	
Net receipts			\$345,336 79

Attest :

WALTER H. HARDING,
Registrar.

CAMBRIDGE, December 15, 1903.

We have examined the accounts of the Water Registrar and find that they correspond in the amounts collected, abated, refunded, and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor.

WILLIAM B. DURANT,
Committee on Accounts.

CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER,

December 1, 1903.

To the Cambridge Water Board:—

I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1903.

Gross collections for account of water works—"Maintenance," "Water Rates" and "Supply" Accounts	\$346,534 45
Gross collections for account of water works—"Construction" Accounts	5,727 85
"Statement" certificates received and paid on "Water Rates"	2,726 45
"Refund" certificates received and paid to amount of	3,169 06
Uncollected bills in my hands November 30, 1903, for account of "Water Rates," "Maintenance" and "Supply" Accounts	6,132 14
Uncollected bills November 30, 1903, for account of "Construction"	269 33

Very respectfully,

WM. W. DALLINGER,
City Treasurer.

I have examined the above statement and find it correct.

HARRY. T. UPHAM,
City Auditor.

FRESH POND AND SURROUNDINGS.

The small appropriation made for work about the Pond this year not permitted the employment of as many men as usual, and the completion of the roads, walks and planted sections has not been what we could have wished.

The low water in the Pond and the consequent growth of vegetation therein has made a great amount of extra work necessary and nearly the whole season two or more men have been constantly at work removing the same.

Grass not wanted by the department has as usual been sold to the highest bidder.

The average height of the Pond has been 13.08.

FRESH POND RESERVOIR.

DATE.	Lowest Elevation During Month.	Highest Elevation During Month.	Monthly Rainfall, Inches.	INTAKE GATE.			
				8-inch Opening.		30-inch Opening.	
				Opened.	Closed.	Opened.	Closed.
1902.							
December 21.	13.20	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
December 8.	.....	13.66	.....			
December.....	.....	.....	4.37				
1903.							
January 29.	12.97	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
January 7.	.....	13.60	.....			
January.....	.....	.....	3.19				
February 4.	12.95	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
February 19.	.....	13.33	.....			
February.....	.....	.....	3.50				
March 1.	13.08	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
March 31.	.....	14.02	.....			
March.....	.....	.....	4.89				
April 1.	13.96	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
April 23.	.....	14.64	.....			
April.....	.....	.....	3.98				
May 31.	13.48	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
May 1.	.....	14.49	.....			
May.....	.....	.....	.35				
June 12.	12.93	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
June 26.	.....	13.56	.....			
June.....	.....	.....	8.46				
July 19.	12.94	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
July 2.	.....	13.50	.....			
July.....	.....	.....	3.72				
August 30.	12.61	.....	.....	August 6th, 11 o'clock p.m., 28 turns	August 6th, 7 o'clock a.m.	August 6th, 11 o'clock p.m., 30 in.	August 7 o'clock a.m.
August 1.	.....	12.96	.....	During entire month, 28 turns		During entire month, 30 in.	
August.....	.....	.....	3.81				
September 30.	12.04	.....	.....	During entire month, 28 turns		During entire month, 30 in.	
September 3.	.....	12.83	.....			
September.....	.....	.....	1.72				
October 31.	11.83	.....	.....	October 2d, 8.15 o'clock p.m., 28 turns	October 2d, 8.15 o'clock a.m.	October 2d, 8.15 o'clock p.m., 30 in.	October 8.15 a.m.
October 18.	.....	12.26	.....	November 15th 11.30 o'clock a.m., 28 turns		November 15th 11.30 o'clock a.m., 30 in.	
October.....	.....	.....	4.54				
November 29.	11.50	.....	.....		
November 2.	.....	11.98	.....			
November.....	.....	.....	1.70				
			44.23				

PUMPING STATION AND GROUNDS.

The grounds about the station have received the usual care and are in good condition.

All of the buildings at the station should be painted this year.

No repairs have been made on the dwellings the past year and they are badly in need of painting.

PAYSON PARK RESERVOIR.

The north basin of the reservoir has been cleaned and the iron fence painted.

The grounds have received a coat of dressing and are in good condition.

The gate house stone work has been pointed in places but will need a thorough overhauling in the near future.

PIPE YARD.

The dwelling and sheds at the yard should be shingled this year.

The stable and shop are in good condition and will need no repairs.

HIGH SERVICE.

Following is the list of streets supplied from the high service:—

Agate Street.	Holly Avenue.
Appleton Street, from Highland Street to beyond Hutchinson Street.	Humboldt Street.
Attingham Street.	Huron Avenue, from Appleton Street to Raymond Street.
Aves Hill Street.	Lancaster Street.
Bain Street.	Linnæan Street.
Bellvue Avenue.	Mt. Pleasant Street.
Bellvue Avenue, west.	Raymond Street, from Linnæan Street to Walden Street.
Brown Vista Park.	Reservoir Street, from Highland Street.
Canfield Avenue, from Huron Avenue to Buckingham Street.	Upland Road, from Richdale Avenue to Huron Avenue.
Carleton Street, from Huron Avenue to Linnæan Street.	Vassal Lane, from Huron Avenue.
Highland Street, from Reservoir Street to Appleton Street.	Vincent Street.
Hillside Avenue.	Walnut Avenue.
	Washington Avenue.

MAIN PIPE.

Six thousand eight hundred seventy and one-half ($6,870\frac{1}{2}$) feet of main pipe have been laid during the year; of the foregoing amount five thousand six hundred sixty-one and one-half ($5661\frac{1}{2}$) feet were laid in renewing pipe that had been in use for many years, and twelve hundred nine (1,209) feet were laid in new locations for extensions.

The account of main pipe laid will be found on pages 29 and 37.

The streets in which the main pipes were renewed are as follows:

In Chestnut Street from Magazine Street to Pleasant Street there were five hundred sixty-two (562) feet of six-inch laid to take the place of the old four-inch laid in 1872 and 1873.

In Essex Street from Massachusetts Avenue to near Percy Place seven hundred fifty-five (755) feet of six-inch have been laid; the four-inch pipe which formerly supplied this locality has been in use since 1869 and 1878.

In Frank Street from Massachusetts Avenue to Locke Street, four hundred (400) feet of six-inch have been laid; the street has been furnished through a four-inch pipe which was laid in 1873.

In Harvard Street from Quincy Street to Dana Street fifteen hundred ninety-four (1,594) feet of twelve-inch pipe have been laid.

In Harvard Street from Dana Street east three hundred twenty (320) feet of ten-inch have been laid.

A six-inch pipe has been in use in this street since 1867.

In Magazine Court from Magazine Street to Kenwood Street two hundred eighty and one-half ($280\frac{1}{2}$) feet of four-inch have been laid to replace the old three-inch and four-inch laid in 1867 and 1884.

In Prince Street from Magazine to Pleasant Street five hundred fifty (550) feet of six-inch have been laid; an old four-inch pipe supplied this vicinity; it was laid in 1868.

In Second Street from Thorndike Street to Charles Street seven hundred fifty (750) feet of six-inch pipe have been laid; an old four-inch has supplied this location; it was originally laid in 1869, 1881 and 1887.

In Spring Street from Second Street east and west four hundred seventeen (417) feet of six-inch pipe have been laid; an old four-inch laid in 1869, 1883 and 1887 has been removed.

SUPPLIES.

The table of the number and sizes of the supplies laid during the year to furnish water in locations not previously supplied will be found on page 37; the total number laid for this purpose being one hundred and twenty-three (123) in sizes from three-quarters-inch to eight-inch.

The addition of the foregoing number of supplies makes the total number laid to date, November 30, 1903, fourteen thousand six hundred and ninety-two (14,692).

There have been ten large supplies laid for manufacturing purposes and for protection from fire, as follows: American Net and Twine Company, one six-inch and one eight-inch; Boston & Maine Railroad Company, one six-inch; Cambridge Laundry, one six-inch; Irving & Casson, one six-inch; Ivers & Pond Piano Company, one six-inch; Lever Brothers Company, one eight-inch; Lockhart & Company, W. L., one six-inch; Sawyer, H. M., & Company, one six-inch; and Simplex Electrical Company, one eight-inch.

There have been extensions made on the fire protection pipes located on the premises occupied by the George F. Blake Manufacturing Company, Irving & Casson, and Simplex Electrical Company.

Forty-two (42) old supplies have been furnished with sidewalk shut-off boxes.

One hundred seventy-four (174) supplies have been renewed at the request of owners or where necessary on account of leakage.

When renewing the main pipes it has been necessary to renew the supplies to the property line. Following will be found the list of supplies renewed under these conditions:

Chestnut Street	10	3-4-inch
Essex Street	19	3-4-inch
	3	1-inch
	2	1 1-4-inch
Frank Street	3	3-4-inch
	1	1 1-4-inch
Harvard Street	15	3-4-inch
	6	1-inch
	1	1 1-4-inch

Locke Street	1	3-4-inch
Magazine Court	2	3-4-inch
Prince Street	8	3-4-inch
	4	1-inch
Second Street	8	3-4-inch
	1	1-inch
Spring Street	8	3-4-inch
	3	1-inch

Anticipating the paving with bricks of Cambridge Street from Inman Square to Prospect Street, and in River Street from Kinnaird Street to Putnam Avenue, the supplies, as follows, were renewed:

Cambridge Street	18	3-4-inch
	4	1-inch
	1	1 1-4-inch
	1	1 1-2-inch
River Street	37	3-4-inch
	6	1-inch
	1	1 1-4-inch

In Parker Street the main pipe from Buckingham Street to near Reley Street has been raised; all of the service boxes in the street have been raised and four of the supplies raised and renewed.

The total number of supplies renewed during the year was three hundred thirty-one (331).

Following is the list of establishments having fire protection from the City of Cambridge:—

American Rubber Co.,	Binney Street,	Two 6-in.
American Net & Twine Co., . .	Third Street,	Two 6-in.
American Net & Twine Co., . .	Third Street,	6-in.
American Vulcanized Fibre Co.,	Tannery Street,	2-in.
Baker Asphalt Paving Co., . .	First Street,	6-in.
Bay State Metal Works,	Harvard Street,	6-in.
Baker & Shepard,	Osborn Street,	2-in.
Bate, Geo. F., Manufacturing Co.,	Binney Street,	6-in.
	Third Street,	4-in.
Boston Book Binding Co., . . .	Mt. Auburn Street, . . .	6-in. & 4-in.
Boston Elevated Railway Co., .	Baldwin Street,	2-in. & 4-in.
" " " " " " " " " "	Cambridge Street, . . .	Two 2-in.
" " " " " " " " " "	Felham Street,	Three 4-in.
" " " " " " " " " "	Massachusetts Avenue, .	4-in.
" " " " " " " " " "	Mt. Auburn Street, . . .	4-in. & 2-in.
" " " " " " " " " "	Murray Street,	4-in.
" " " " " " " " " "	River Street,	4-in.

Boston & Maine Railroad, . . .	Bridge Street, . . .	4-in.
" " " . . .	Bridge Street, . . .	6-in.
" " " . . .	East Street, . . .	6-in.
" " " . . .	Prison Point Street, . . .	4-in.
Boston Woven Hose & Rubber Co., . . .	Portland Street, . . .	8-in. & 10-in.
Cambridge Gas Light Co., . . .	Third Street, . . .	6-in.
Cambridge Electric Light Co., . . .	Western Avenue, . . .	6-in.
Cambridge Laundry, . . .	Kinnaird Street, . . .	6-in.
Cambridge Mutual Fire Insurance Co., . . .	Massachusetts Avenue, . . .	2-in.
Chelmsford Foundry Co., . . .	Portland Street, . . .	2-in.
Dover Stamping Co., . . .	Pleasant Street, . . .	6-in.
Fogarty & Daly, . . .	Massachusetts Avenue, . . .	4-in.
Ginn & Co., . . .	First Street, . . .	Two 6-in.
" " " . . .	Athenaeum Street, . . .	8-in.
Goepper Brothers, . . .	Ninth Street, . . .	1 1-2-in.
Harvard University, . . .	Harvard St., Harvard Union, . . .	4-in.
" " " . . .	Cambridge St., Memorial Hall, . . .	4-in.
" " " . . .	Concord Avenue, Observatory, . . .	6-in.
" " " . . .	Divinity Ave., Semitic Mus'm, . . .	4-in.
Holy Ghost Hospital for Incurables, . . .	Hovey Avenue, . . .	3-in.
Houghton, Mifflin & Co., . . .	Albro & Blackstone Streets, . . .	6-in.
" " " . . .	River Street, . . .	6-in.
Irving & Casson, . . .	Otis Street, . . .	6-in.
" " " . . .	Thorndike Street, . . .	Two 6-in.
" " " . . .	Thorndike Street, . . .	2-in.
Ivers & Pond Piano Co., . . .	Albany Street, . . .	4-in. & 6-in.
Jones, C. L., & Co., . . .	Pearl Street, . . .	4-in.
Keeler & Co., . . .	Thorndike Street, . . .	1-in.
Kendall, Edward, & Sons, . . .	Main Street, . . .	2-in.
Lamb & Ritchie, . . .	Albany Street, . . .	6-in.
Lever Brothers Co., . . .	Broadway, . . .	6-in.
" " " . . .	Broadway, . . .	8-in.
Little, Brown & Co., . . .	Putnam Avenue, . . .	6-in.
Lockhart, Wm. L., & Co., . . .	First Street, . . .	6-in.
Luke, E. H., Estate of, . . .	Main Street, . . .	2-in.
Mason & Hamlin Co., . . .	Broadway, . . .	Two 6-in.
Massachusetts Athletic Association, . . .	Lansdowne Street, . . .	4-in.
Metropolitan Storage Warehouse Co., . . .	Massachusetts Avenue, . . .	6-in.
Middlesex C'ty, House of Correction, . . .	Second & Spring Streets, . . .	6-in.
National Biscuit Co., . . .	Franklin Street, . . .	4-in.
" " " . . .	Franklin Street, . . .	6-in.
" " " . . .	Green Street, . . .	8-in.
National Linseed Oil Co., . . .	Fifth Street, . . .	6-in.
North Packing & Provision Co., . . .	Windsor Street, . . .	6-in.
O'Brien, John (Rev.), . . .	Seventh Street, . . .	4-in.
Page, Geo. G., Box Co., . . .	Hampshire Street, . . .	6-in. & 4-in.
Pettersen, Oscar G., . . .	483 Main Street, . . .	4-in.
Pierce, Thomas, Trustees of Estate of, . . .	Broadway, . . .	6-in. & 4-in.
Pi Eta Club, . . .	Winthrop Street, . . .	2-in.
Porter, Henry S., . . .	Kinnaird Street, . . .	4-in.
Reardon, John, & Sons, Corporation, . . .	Waverly Street, . . .	4-in.
Reardon, William, . . .	Portland Street, . . .	2-in.
Revere Sugar Refinery, . . .	Water Street, . . .	6-in.
Reversible Collar Co., . . .	Putnam Avenue, . . .	6-in.
Russell, Lucy J., . . .	29 Elm Street, . . .	1 1-2 in.
Rice, P. G., & Co., . . .	Massachusetts Ave. & Lee St., . . .	Two 2-in.

L. & Son,	-	-	Thornlike Street,	-	-	4-in.
"	-	-	Second Street,	-	-	6-in.
ring Co.,	-	-	Third Street,	-	-	6-in.
ring Co.,	-	-	First Street,	-	-	4-in.
(Co.,	-	-	Auburn Street,	-	-	5-in.
"	-	-	Auburn Street,	-	-	6-in.
"	-	-	Franklin Street,	-	-	8-in.
"	-	-	Broadway,	-	-	2-in.
Co.,	-	-	Hampshire Street,	-	-	6-in.
son & Co.,	-	-	Eggers Street,	-	-	4-in.
"	-	-	Sixth Street,	-	-	4-in.
"	-	-	Futter Street,	-	-	6-in.
Works,	-	-	Main Street,	-	-	2-in.
Co.,	-	-	Broadway,	-	-	6-in.
& Son,	-	-	Broadway,	-	-	4-in.
ates,	-	-	Linden Street,	-	-	4-in.
"	-	-	Massachusetts Avenue,	-	-	6-in.
"	-	-	Nutting Place,	-	-	6-in.
"	-	-	Mt. Auburn St., Claverly Hall,	-	-	4-in.
sons,	-	-	Albany Street,	-	-	4-in.

DRINKING FOUNTAINS.

been no addition this year to the number of drinking fountains—twenty-eight (28) in use, of which four (4) are ice water fountains.

Other drinking fountains were supplied with ice from June 15th, inclusive, at an expense of four hundred fifty-two cents (\$452.91), as follows:—

1 Square fountain	-	-	-	\$108.45
Cambridge fountain	-	-	-	172.20
ed Square fountain	-	-	-	87.45
Cambridge fountain	-	-	-	84.81
				<hr/>
				\$452.91

The cost per day of supplying the ice water fountains was nine cents (\$1.06).

On account of the prevalence of glanders and at the request of the Board, the fountains this year have received careful and constant inspection, outside of the usual inspection and repairs.

All old drinking fountains have been thoroughly repaired and new ones added to the cocks and piping and are now in first-class condition.

STREET WATERING STANDPIPES.

At this date, November 30, 1903, there are sixty-two (62) street watering standpipes in use.

During the year one standpipe has been added to the list; it was on Granite Street.

The standpipe which was formerly located at the corner of Mair Street and Portland Street has been removed and set in Albany Street opposite Ivers & Pond Piano Company's factory.

During the year the standpipes in thirty-three (33) locations have been repaired, and the cost of such repairs charged to the Street Department.

GATES.

Twenty-three (23) gates have been set. (See recapitulation table on page 37.)

Three (3) on extension of main pipes.

Eleven (11) on renewal of main pipes.

Nine (9) on supplies.

The inspections of gates have been made and the locations where necessary carefully marked.

BOXES.

The total number of boxes set during the year was fifty-three (53).

Fourteen (14) iron boxes have been set on extension and renewal work.

Four (4) special meter boxes have been set with meters.

Nine (9) iron boxes have been set on new supplies.

Twenty (20) boxes have been set in places of worthless ones removed.

Six (6) meter boxes.

In seven (7) locations the boxes have been lowered.

In ten (10) locations the boxes have been raised.

In four (4) locations the boxes have been repaired, and

In two (2) locations gate boxes have been reset

HYDRANTS.

There are one thousand and five (1,005) hydrants in use at this date, November 30, 1903.

Boston	-	-	-	-	-	-	-	-	157
Chapman	-	-	-	-	-	-	-	-	519
Coffin	-	-	-	-	-	-	-	-	42
Flush	-	-	-	-	-	-	-	-	106
Holyoke	-	-	-	-	-	-	-	-	89
Perkins	-	-	-	-	-	-	-	-	92
									1,005

Three flush hydrants have been removed as follows: In Harvard Street at Remington Street; in Brookline Street at Erie Street, and in Bow Street at Blackstone Street.

One Chapman hydrant has been removed at the corner of Webster Avenue and Hampshire Street.

One Perkins hydrant has been removed from the corner of Bridge and Cary's yard.

An account of the hydrants set in new locations and in place of old ones removed will be found on page 29.

The inspection of hydrants has been made, and in the many cases where the hydrants would not work they have been attended to and received necessary care.

METERS.

There are twenty-three hundred twenty-six (2,326) meters in use at this date.

Below find kind, size and number of meters in use on domestic supplies and manufactories:—

	1.0 inch.	1.4 inch.	1 inch.	1.12 inches.	2 inches.	3 inches.	4 inches.	6 inches.	Total.
WATER	30	10	0	0	4	0	0	0	44
SEWER	0	0	0	0	0	0	0	0	0
INDUSTRIAL	140	200	111	14	23	4	1	1	1,104
WATER	100	20	4	0	0	0	0	0	124
SEWER	0	0	0	0	0	0	0	0	0
INDUSTRIAL	1	0	0	1	0	0	0	0	2
WATER	277	220	66	22	10	4	0	0	799
SEWER	0	0	0	0	0	0	0	0	0
INDUSTRIAL	0	0	0	0	0	0	0	0	0
WATER	10	0	10	0	22	0	4	0	46
SEWER	0	0	0	0	0	0	0	0	0
INDUSTRIAL	0	0	0	0	0	0	0	0	0
Total	1,200	300	181	14	79	18	5	2	2,326

And on public buildings, schools, etc. :—

	5.8 inch.	3.4 inch.	1 inch.	1 1-2 inches.	2 inches.	Total.
Ball & Fitts.....			1			1
Crown.....	1		2			3
Hersey.....	1	11	15		1	28
Trident.....	5	2	10	1		18
Thomson.....				1		1
Union Rotary.....				1	1	2
Worthington.....		3	6			9
Total	7	16	34	3	2	62

During the year there were two hundred thirty-seven (237) meters added to the list as follows :—

	5.8 inch.	3.4 inch.	1 inch.	1 1-2 inches.	2 inches.	3 inches.	4 inches.	Total.
Crown	1	2			1		1	5
Hersey.....	47	14	9		1			71
Lambert.....	56	9	3					68
Trident.....	67	9	4	1				81
Union Rotary.....	2	2			2	1	1	8
Worthington.....	3			1				4
Total.....	176	36	16	2	4	1	2	237

STONY BROOK PIPE LINE.

The work of raising a portion of this pipe in Waltham along the banks of the river, which was in progress at the date of the last report, was completed. It required the raising of about six hundred feet in length from one to three feet.

The portion in Pleasant Street, Watertown, which was too high to admit the change in grade of the street contemplated by the town authorities, was lowered for a distance of about eight hundred feet from one to three feet. This portion was through ledge, and the work was successfully accomplished without shutting off the water from the main.

For an account of the work done on this line during the past year I would refer to the report of Mr. Freeman C. Coffin, which is attached.

STONY BROOK.

The care for the drainage of this water shed has required the construction of three more cesspools this season, making twenty-one cesspools and nineteen vaults on this shed, all of which are cared for by this department outfit.

HOBBS BROOK.

As usual all standing grass not needed by the department has been sold to the highest bidder. The bushes and weeds along the fences have been cut and the grass on the dams kept mowed.

RECAPITULATION.

SUPPLIES.	12 Inch	8 Inch	6 Inch	5 Inch	4 Inch	3 Inch	2 Inch	1 Inch	Total
Length, in feet, of pipe.....	41	96	180	171	81	154	1,279	3,503	5,825
Number of supplies.....		3	7	5	2	4	22	80	123
Number of stop and waste valves.....				2	1	5	20	60	88
Number of access tanks.....				4	2	4	21	67	98
Number of air-valve tanks.....						4	21	82	107
Number of service tanks.....									164
Number of gates.....									9
Number of gate boxes.....									14

RECAPITULATION.

MAIN PIPE.	12 Inch	10 Inch	8 Inch	6 Inch	5 Inch	4 Inch	Total
Length, in feet, of pipe extension.....			800	170	39	112	1,280
Length, in feet, of pipe renewals.....	1,204	220	3,407	290			5,121
Total length, in feet, of pipe.....	1,204	220	4,207	460	39	112	6,242
Number of gates.....							14
Number of hydrants.....							9

TABLE SHOWING THE DAILY AVERAGE GALLONS, BY THE MONTH, FLOWING OVER THE WASTE WAY AT STONY BROOK.

	Gallons.	Number of Days.		Gallons.	Number of Days.
December, 1902.....	207,000,000	27	June, 1903.....	221,700,000	22
January, 1903.....	220,000,000	21	July, 1903.....	227,700,000	27
February, 1903.....	202,500,000	29	August, 1903.....	20,000,000	9
March, 1903.....	1,024,800,000	21	September, 1903.....		
April, 1903.....	1,202,400,000	30	October, 1903.....	71,800,000	22
May, 1903.....	141,700,000	22	November, 1903.....		

Total amount wasted 6,437,500,000 gallons.
 Total number of days in which water wasted 222

STONY BROOK.				LINCOLN STREET BASIN. Dam Number 1.				HOBBS BROOK. WINTER STREET BASIN. Dam Number 2.				REMARKS.	
Date.	Lowest elevation during month.	Highest elevation during month.	Rain- fall.	Date.	Lowest elevation during month.	Highest elevation during month.		Date.	Lowest elevation during month.	Highest elevation during month.	Rain- fall.	Flash-boards removed.	Flash-boards set.
Dec. 16, 1902	80.63	81.79	5.68	Dec. 15, 1902	180.53	181.20		Dec. 1, 1902	178.48	180.55	5.86		
Dec. 23, 1902		81.83		Dec. 22, 1902		181.20		Dec. 31, 1902		180.55			
Jan. 20, 1903				Jan. 1, 1903	180.78			Jan. 1, 1903	180.55				
Jan. 22, 1903			3.77	Jan. 22, 1903		181.50		Jan. 25, 1903		181.55	3.24		
Feb. 25, 1903	81.33			Feb. 25, 1903	181.35			Feb. 26, 1903	181.30				
Feb. 5, 1903		81.92	4.01	Feb. 28, 1903		181.60		Feb. 5, 1903		181.55	3.34		
Mar. 21, 1903	81.50			Mar. 20, 1903	181.48			Mar. 20, 1903	181.43				
Mar. 24, 1903		82.25	6.13	Mar. 24, 1903		181.80		Mar. 24, 1903		181.70	6.09		
Apr. 30, 1903	81.33			Apr. 30, 1903	181.38			Apr. 30, 1903	181.33				
Apr. 10, 1903		82.07	3.37	Apr. 9, 1903		181.75		Apr. 10, 1903		181.65	3.31		
May 31, 1903	80.06			May 28, 1903	181.10			May 28, 1903	181.08				
May 1, 1903		81.31	.80	May 1, 1903		181.38		May 1, 1903		181.33	.82		
June 4, 1903	79.85			June 11, 1903	180.90			June 8, 1903	180.75				
June 23, 1903		82.12	7.45	June 22, 1903		181.80		June 22, 1903		181.75	8.47		
July 18, 1903	80.83			July 18, 1903	181.20			July 18, 1903	181.15				
July 2, 1903		81.50	3.48	July 1, 1903		181.48		July 1, 1903		181.43	3.71		
Aug. 20, 1903	80.10			Aug. 28, 1903	181.05			Aug. 29, 1903	180.85				
Aug. 7, 1903		81.23	3.66	Aug. 7, 1903		181.35		Aug. 7, 1903		181.30	4.08		
Sept. 17, 1903	80.04			Sept. 20, 1903	180.50			Sept. 30, 1903	180.40				
Sept. 9, 1903		81.00	1.99	Sept. 6, 1903		181.10		Sept. 7, 1903		181.00	2.45		
Oct. 1, 1903	80.40			Oct. 1, 1903	180.50			Oct. 8, 1903	180.20				
Oct. 19, 1903		81.33	4.19	Oct. 18, 1903		180.90		Oct. 31, 1903		180.75	4.57		
Nov. 12, 1903	80.00			Nov. 1, 1903	180.77			Nov. 16, 1903	180.63				
Nov. 21, 1903		81.00	1.44	Nov. 30, 1903		180.84		Nov. 28, 1903		180.80	1.48		
			45.97								47.43		

Gates closed during entire year.

COMPARATIVE TRENDING FOR THE PAST TEN YEARS

Year	Revenue	Expenses	Total Cost	Margin
1900	\$100,000	\$100,000	\$100,000	0.00
1901	105,000	105,000	105,000	0.00
1902	110,000	110,000	110,000	0.00
1903	115,000	115,000	115,000	0.00
1904	120,000	120,000	120,000	0.00
1905	125,000	125,000	125,000	0.00
1906	130,000	130,000	130,000	0.00
1907	135,000	135,000	135,000	0.00
1908	140,000	140,000	140,000	0.00
1909	145,000	145,000	145,000	0.00
1910	150,000	150,000	150,000	0.00

Prepared by the Superintendent of Water Works, Engineer

EDWIN C. BLOOMER,

EDWIN C. BLOOMER,

EDWIN C. BLOOMER,

REPORT OF THE PUMPING ENGINEER

PUMPING STATION, CAMBRIDGE WATER WORKS,
December 1, 1903.

Mr. EDWIN C. BROOKS, *Supt.*

MY DEAR SIR:—I would report the machinery at the pumping station in good condition.

During the year the Worthington Engine No. 1 has been run sixty hours forty-five minutes, and Worthington Engine No. 2 has been run sixty hours. Aside from this, the Leavitt Engine No. 7 has pumped all of the water used by the City.

The tubes in No. 1 Receiver on Leavitt Engine No. 7 have been repacked.

I would recommend the changing the tubes in No. 1 Receiver on Engine No. 7 to a copper coil the same as in No. 2 Receiver in order to avoid repacking every year; this can be done at a small expense, as the material taken out and sold will nearly pay for the copper coil.

There has been a jacket and boiler feed pump attached to Engine No. 7; this change saves the expense of running two auxiliary pumps. It was designed and manufactured here at the pumping station at the cost of castings only.

By permission of the Water Board the pump and receiver formerly used for jacket pump were exchanged for a Fort Wayne twenty-ampere forty-light dynamo to be run through the night. This is connected to our small shop engine and saves from four hundred to five hundred pounds of coal per night over our large light engine, which is very wasteful running with a light load.

A mercury column and float gauge has been placed in the engine room; very accurate readings are thus obtained as to head pumped against heights of water in pond and reservoir.

The boilers are in good condition, but will require new brick arches in the fire boxes this coming year.

The fire room walls and boilers have been painted by the employees of the station.

The quality of coal used at the station during the "coal strike" last year (a sort of burning as high as sixteen per centum ash) has cut down on the materials, i. e., 1902, 115,974,963; 1903, 114,844,888.

Respectfully submitted,

E. I. HARRIS,

Chief Engineer

OPERATING EXPENSES AT PUMPING
STATION.

Coal	\$12,618.38
Express	15.85
Oil, grease and packing	435.60
Repairs on engines and boilers	310.59
Repairs on buildings	225.92
Telephone	69.51
Tools and hardware	90.71
Miscellaneous	44.68
Salaries	6,893.47
	<hr/>
	\$20,704.71

SUMMARY OF STATISTICS

FOR THE YEAR ENDING NOVEMBER 30, 1903.

In form recommended by the New England Water Works Association.

CAMBRIDGE WATER WORKS.

CITY OF CAMBRIDGE, COUNTY OF MIDDLESEX, STATE OF MASSACHUSETTS.

GENERAL STATISTICS.

Population by census of 1900 — 91,886.

Date of construction — 1855.

By whom owned — City of Cambridge.

Source of supply — Hobbs Brook and Stony Brook in Lincoln, Waltham and Weston, and Fresh Pond in Cambridge.

Mode of supply (whether gravity or pumping) — Gravity from Hobbs and Stony Brooks to Fresh Pond, pumping from Fresh Pond to Payson Park Reservoirs, thence by gravity to consumers.

PUMPING STATISTICS.

1. Builders of pumping machinery — One Leavitt, built by Groshon High Duty Pumping Engine Company; two Worthington; one Blake.

2. Description of fuel used — *a.* Kind — bituminous.

b. Brand of coal — Cumberland.

c. Price of coal per gross ton, delivered, Dec., 1902, \$7.25; Jan., 1903, \$9.50; Feb., 1903, \$8.10; April, 1903, \$5.30; June, 1903, \$5.39; Sept., 1903, \$5.23; Nov., 1903, \$4.20.

3. Coal consumed for the year — 4,462,469 lbs.

4. (Pounds of wood consumed) \div 3 = equivalent amount of coal, 500 lbs.

5. Total equivalent coal consumed for the year = (3) + (4), 4,462,969 lbs.

6. Total pumpage for the year — 3,160,704,360 gallons, without allowance for slip.

7. Average static head against which pumps work — 158.03 feet.

8. Average dynamic head against which pumps work — 194.44 feet.

9. Number of gallons pumped per pound of equivalent coal (5),

$\frac{3,160,704,360 \text{ gal. pumped} \div 9.54 \text{ (lbs.)} \div 100 \times \text{dynamic head, 194.44}}{\text{Total fuel consumed, 4,462,949.}} = 114,844,888\frac{1}{2}$

Cost of pumping, figured on pumping station expenses, viz.,

11. Per million gallons pumped — \$6.55.

12. Per million gallons raised one foot (dynamic) — \$.033.

1 Live-day engines were run 120 hours during year.

FINANCIAL STATISTICS FOR YEAR 1903.

RECEIPTS.

From ordinary (maintenance) receipts.	\$ 5,831 60
From Water Rates:	
Total from consumers	336,946 40
Abolitions, etc.	3,756 45
Construction	5,727 85
	<u>\$352,262 30</u>

EXPENDITURES.

Water Works Maintenance:	
Operation (management and repairs)	\$28,753 48
Special:	
Pumping	\$20,704 71
Reservoir	11,879 86
Ice	460 56
	<u>33,036 13</u>
Total maintenance	\$61,789 61
Interest on bonds	153,086 50
	<u>\$194,876 11</u>
Sinking Fund	121,522 50
Water Works Construction:	
Extension of mains	\$8,429 25
Extension of services	2,499 90
Extension of motors	2,212 51
	<u>\$13,141 66</u>
Amounts carried forward	\$316,398 61

<i>Amounts brought forward</i>	.	.	.	.	\$13,141 66	\$316,398 4
Special :						
Hobbs Brook	.	.			\$12,229 61	
Stony Brook Main	.				3,482 18	
					<u>15,711 79</u>	
Total construction	.	.	.	.		28,853 4
Unclassified expenses	.	.	.	.		<u>6,925 4</u>
						<u>\$352,177 4</u>
Net cost of works to date	.	.	.	.	\$5,750,655 15	
Bonded debt at date	.	.	.	.	3,350,600 00	
Value of Sinking Fund at date	.	.	.	.	1,062,821 46	
Average rate of interest	.	.	.	.	3½ and 4 per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1. Estimated total population at date — 96,685.
2. Estimated population on lines of pipe — 96,685.
3. Estimated population supplied — 96,685.
4. Total consumption for the year — 3,160,704,360 gallons.
5. Passed through meters — 1,074,317,752 gallons.
6. Percentage of consumption metered — 34 per cent.
7. Average daily consumption, 8,659,463 gallons.
8. Gallons per day to each inhabitant — 89.56.
9. Gallons per day to each consumer — 89.56.
10. Gallons per day to each tap, 589.
11. Cost of supplying water, per million gallons, figured on total maintenance, \$19.55.
12. Total cost of supplying water, per million gallons, figured on total maintenance + interest on bonds, \$60.31.

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

Kind of pipe — cast iron.

Sizes — From 2-inch to 40-inch.

Extended 1,209 feet during year.

a. — Discontinued 5,661½ feet during year.

b. — Renewed 5,661½ feet during year.

SUMMARY OF STATISTICS

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Total water use 125.35 miles
 Cost of repairs per mile \$5.05
 Number of valves per mile 1.007
 Length of pipes less than 4 inches diameter 3.21 miles
 Number of hydrants added during year (public) 4
 Number of hydrants (public and private) now in use 1,005
 Number of stop gates added during year 14
 Number of stop gates smaller than 4 inch None
 Length of pressure mains 45 lbs. to 55 lbs.

SERVICES

Number of pipes standardized 100
 Number of pipe fittings under two inches 3 inch, 4 inch, 6 inch and 8 inch 1,200
 Number of valves 100
 Number of hydrants 100
 Number of stop gates added during year 120
 Number of valves 10,000
 Average length of service 45 feet
 Cost of water service for the year \$17.51
 Number of meters added 200
 Number of meters 2,000
 Percentage of service metered 15 per cent

The following statement is from the report of the Commissioners of the Sinking Fund of the City of Cambridge, and shows the present condition of the Water Loan Sinking Fund :—

WATER WORKS FUND.

BOND ACCOUNT.

Amount of bonds in the Fund, November 30, 1902	\$331,900 00
Amount of bonds purchased during the year . .	73,000 00
	<hr/>
Amount of bonds, at par value, in the Fund November 30, 1903	\$904,900 00

CASH ACCOUNT.

Cash on hand, November 30, 1902	\$75,735 98
Cash received from Water Rates, Fines, etc. . . .	123,145 78
Cash received for interest on investments . . .	34,437 99
	<hr/>
	\$233,319 75
Cash paid for bonds purchased	\$73,000 00
Cash paid for premium on bonds purchased . . .	1,803 10
Cash paid for accrued interest on bonds purchased	595 19
	<hr/>
	75,396 29
Cash on hand, November 30, 1903	<hr/>
	\$157,921 46
Total amount of the Water Works Sinking Fund, November 30, 1903	\$1,062,821 46

(Signed) FRANK A. ALLEN, } Committee
JOHN C. BULLARD, } on
Accounts.

The following are the investments belonging to the Water Loan Funds :—

Cambridge	City bonds	3 1-2s, Maturing Nov. 1, 1912	\$20,000 00
"	" "	4s, " Feb. 1, 1913	2,000 00
"	" "	4s, " Oct. 1, 1916	65,100 00
"	" "	3 1-2s, " Dec. 1, 1917	40,000 00
"	" "	3 1-2s, " Nov. 1, 1919	20,000 00
"	" "	4s, " Nov. 1, 1920	5,000 00
			<hr/>
Amount carried forward			\$152,100 00

SPECIAL REPORT OF CONSULTING ENGINEER TO THE CAMBRIDGE WATER BOARD

Boston, December 1, 1903.

To the Water Board of Cambridge, Massachusetts:—

GENTLEMEN:—I submit the following report upon the condition of the existing pipe conduit from Stony Brook dam to Fresh Pond, also upon the necessity for a new or additional pipe line, the best location for it, and its proper size, with estimates of cost.

PRESENT PIPE LINE OR CONDUIT.

This line is composed of 5,100 feet of thirty-six-inch cast-iron pipe from the dam at Stony Brook basin to a point near the pumping station of the Waltham Water Works, and from this point 34,340 feet of thirty-inch cast-iron pipe to the point of discharge in Fresh Pond.

There is a total fall from the crest of the dam at Stony Brook basin to the high water line in Fresh Pond of 64.15 feet. The profile of the pipe line is such, however (owing to a high point or summit on the line near Fresh Pond), that the effective or working head on the pipe is only thirty-four or thirty-five feet.

This head would in this pipe when new and clean indicate a discharge of about nine and one-half million gallons in twenty-four hours. When the gate in the gate house at Fresh Pond is opened (after being closed), nearly, if not quite, the full head of sixty-four feet would be effective for a short time on account of the vacuum formed at the summit near Fresh Pond, and the discharge would be increased to perhaps sixteen million gallons (while the pipe was new). The effective head would be gradually diminished by the collection of air at the summits and consequent loss of vacuum, until it would be equal to the actual head at the summit (thirty-four or thirty-five feet), and the discharge would be correspondingly reduced.

The length of time required for the flow of water in the pipe to

attain its normal condition, after opening the gate, depends upon the tightness of the line against air leaks.

The pipe line was laid in 1885 and put into use in 1887, being now sixteen years old as measured by its use. The discharge of the line was measured in 1894 by Mr. L. M. Hastings, City Engineer, and found to be 8,066,500 gallons in twenty-four hours. As I understand the condition under which this measurement was made, there was no effect of vacuum at the time. This measurement indicated a capacity at that time of eighty-five per cent. of the above estimated discharge for new pipe, the pipe being then seven years old.

Later a reduction in the discharge of the pipe was suspected, the Water Board calling attention to the matter in connection with the rapidly increasing consumption of water in several annual reports. In order to obtain as great a flow of water as possible, the Superintendent of the Water Works, Mr. E. C. Brooks, adopted the novel plan of shutting the gate at Fresh Pond once a day and driving the air out of the summits in the line, thus gaining for a time the increased discharge due to a vacuum, as shown by a gage at the Holworthy Street summit, of twenty-six inches when the gate was first opened decreasing to about four inches at the end of twenty-four hours.

Mr. Brooks also installed an air ejector driven by water from the high service mains at Holworthy Street with the intention of removing the accumulation of air and maintaining the vacuum for a longer time.

About the last of June, 1903, the writer was requested to attend a meeting of the Water Board, to meet the members of the Board and the Mayor of Cambridge for a conference in relation to the discharge of the above pipe line, and to see what measures, if any, were necessary to be taken to insure an abundant supply of water for the increasing requirements of the City. The matter was generally discussed at this meeting and at a later one with the Chairman of the Water Board and the Mayor, when the writer was instructed to make such investigations and surveys as he considered necessary or advisable in order to form a correct opinion of the present condition of the pipe line, its discharging capacity, the available means for increasing its capacity, the need of additional or supplementary pipe lines, and their best location.

The first thing to be determined was the present capacity of the line. Upon the assurance from the Builders Iron Foundry that a Venturi meter could be furnished in from three to four weeks, and after a full consideration of other methods of measuring the flow of water through the pipe, a meter was ordered.

In order to ascertain the effect of the ejector which was in use at the Holworthy Street summit, to see if an apparatus of greater capacity would

is more effective in maintaining the vacuum, and to determine the required capacity of such an apparatus, a steam driven air pump was rented and installed, with a boiler, in a temporary wooden building at Holworthy Street.

After considerable unexpected delay in getting the meter, it was installed and observations made of the flow through the pipe line.

The result of these observations shows that when the gate is first opened the discharge of the pipe is at the rate of eight million gallons in twenty-four hours. This is the maximum rate, and it decreases until in two-eight to ten hours it reaches the minimum rate of about five and three-fourths million gallons, which rate it maintains, and in one series of observations, after falling to the above rate, it rose to six millions, and continued at that rate until the gate was again closed.

As far as can be ascertained, the ejector has but little if any effect upon the discharge or upon the vacuum. The latter is shown by the gage falling in substantially the same time and manner with and without the ejector. The air pump did but little better, although of large capacity. It was not found practicable to run it at all until the vacuum was reduced to twenty-two inches.

As the result of this experiment with the air pump, I am of the opinion that nothing can be gained by installing an apparatus of greater capacity than the ejector.

Computations based upon the several series of observations so far made show that approximately the following results can be obtained from the pipe line in its present condition:—

Regular rate of flow with no manipulation of gate, five and three-fourths million gallons in twenty-four hours.

Shutting gate and expelling the air at the summits once in twenty-four hours, six million gallons in twenty-four hours.

Shutting gate and expelling the air at the summits twice in twenty-four hours, six and one-eighth million gallons in twenty-four hours.

Shutting gate and expelling the air at the summits four times in twenty-four hours, six and three-eighths million gallons in twenty-four hours.

In the above estimate the time lost in shutting and opening the gate is considered.

Diagram No. 1 shows graphically the results upon the flow of closing the gate and expelling the air from the summits.

The curved lines on the diagram give the rate of flow per twenty-four hours at any time after the opening of the gate.

It being thought that the accumulation of air in the summits of the pipe line, other than at Holworthy Street, might affect the working of

the air ejector at the latter point and prevent its full benefit from being secured, it was decided to place ejectors upon the other summits, one at a time, and observe the flow.

Accordingly a second ejector was installed at the Dexter Avenue summit. The meter was read and a flow of 6,125,000 gallons in twenty-four hours was obtained with closing the gate once. This showed a gain of about one-fourth of a million gallons in twenty-four hours over the flow before the second ejector was placed. A third ejector was then installed and the flow observed. Two series of observations were made. These did not show a decided increase over the flow with two ejectors, and it was decided not to install any more.

A curve showing the flow of the two ejectors is given on Diagram No. 1, and shows graphically the comparison between the flow with and without the second ejector.

CAN THE CAPACITY OF THE PRESENT PIPE BE INCREASED?

The reduction of capacity in the pipe line from an estimated discharge for new pipe of nine and one-half million gallons to 8,066,500 or eighty-five per cent. in 1894, and to five and three-fourths millions or sixty and one-half per cent. in 1903, indicates strongly that a progressive change is taking place in the interior condition of the pipe.

A definite or special obstruction might be suspected at some particular point in the line. I am of the opinion, however, that there is no such obstruction, but that the reduction in capacity is occasioned by some cause that operates along the entire length of the line in a nearly uniform degree. Aside from general knowledge of the subject, gained from experience with other pipe lines, there is practical proof of this in the action of this line. Carefully tested pressure gages were placed upon gates at intervals along the line, nine in all, and observations made upon these gages simultaneously with readings of the meter. The results of these observations were platted and show that the loss of head due to the friction caused by the water flowing in the pipe was nearly uniform in all of the sections, except that in the fifty-one hundred feet of thirty-six-inch pipe it was greater than in the same length of the thirty-inch pipe. Another peculiarity in the thirty-six-inch pipe was the fact that, with the maximum flow of eight millions, the loss of head was 0.95 feet per one thousand, or less than with the smaller flow of six and one-half millions.

It is well known that tuberculation takes place on many, if not all, cast-iron pipe lines, even when coated, to a degree depending upon the character of the water. It is not known, I believe, what characteristics of the water have the greatest effect upon the pipe.

Actual examination of two lengths of thirty-inch pipe, cut out where the meter was inserted, shows very considerable tuberculation. The tubercles, some of them as large as one and one-fourth inches in diameter at the base and three-eighths of an inch high, in the form of a cone, covered about one-twentieth of the surface of the inside of the pipe. It is probable that the interior of the pipe for its entire length is affected to approximately the same extent.

In coated pipe the tubercles seem to grow or attach themselves to the iron through small holes or imperfections in the coating, and to spread out over the latter. They are easily removed, and in many cases leave the coating nearly as good and smooth as ever.

Tuberculation produces an uneven surface over which the water must flow. This condition increases the friction loss, and reduces the discharging capacity to a far greater extent than the mere loss of area in the cross section of the pipe would indicate.

The friction loss, as determined by the observations made upon this line, is now at least twice that in new pipe, and, as already stated, the capacity of the pipe is reduced nearly forty per cent.

Although the above rate of increase in friction loss after a life of fifteen years is rather more than it is customary to expect, it is quite similar in degree to the loss I have recently found in some piping of the Seaboard, Maine, Water Works, where in a twelve-inch pipe eighteen years old I found the friction loss twice as great as that of new pipe, and in a six-inch pipe of the same age three times as great.

The thirty-six-inch pipe was entered and inspected for a portion of its length, and the growth was greater than in those parts of the thirty-inch pipe which was inspected. This probably accounts for the fact that the loss of head from the same flow was greater than in the thirty-inch than it naturally would be smaller.

There was, however, no indication of a special obstruction in this pipe, and I am of the opinion that there is none and that the excessive loss of head is caused by the growth on the interior sides of the pipe. This does not account for the fact that the loss of head in this section was greater with a flow of six and one-half millions than with that of eight millions. I am unable to explain this.

The growth on the thirty-six-inch pipe, as shown by inspection, consists of "tubercles," or conical-shaped projections on the pipe surface varying from one-fourth of an inch in diameter by one-eighth of an inch high to two inches in diameter by five-eighths of an inch high, and covering perhaps one-tenth of the surface in a generally uniform manner. There was also, especially near the upper end, or the intake, growth of perilla or fresh water sponge. This growth was in patches from the

size of a man's hand to two or three feet square, generally not more than one-eighth of an inch thick, with occasional patches, however, about one-half of an inch in thickness. The entire surface was also covered with a vegetable slime, perhaps one-fourth of an inch in thickness at the upper end, and gradually decreasing to about one-eighth of an inch at the lower end of the thirty-six-inch pipe.

In the thirty-inch pipe the tubercular growth was not quite as heavy, perhaps decreasing towards Fresh Pond. No spongilla was found at the two points of inspection in this size, and there seemed to be less slime as the distance increased from the intake at Stony Brook basin. It was not difficult to remove all of the growths by hand scraping, and the surface coating was left, after such scraping, apparently as good as new. It is probable that tuberculation would begin sooner and progress at a more rapid rate after scraping than in new pipe.

The following table gives the results in loss of head for various quantities of water flowing :—

QUANTITY OF WATER.		36-INCH PIPE.			30-INCH PIPE.		
Million Gallons per 24 Hours.	Cubic Feet per Second.	Loss of Head in Feet per 1,000.			Loss of Head in Feet per 1,000.		
		Actual.	New Pipe Estimated.	Velocity.	Actual.	New Pipe Estimated.	Velocity.
6½	10.07	1.055	0.32	1.43	0.82	0.47	2.05
7	10.84	1.12	0.37	1.54	1.17	0.54	2.22
7½	11.62	0.965	0.42	1.65	....	0.61	2.36
8	12.39	0.944	0.46	1.76	1.44	0.70	2.53

The above estimated friction loss in new pipe does not include anything for open gates or bends. The loss in these will not, I believe, amount to a great deal in this line.

CLEANING THE PIPE.

Water mains have been cleaned, or the tubercles removed, in several instances by means of scrapers inserted into the line and driven through it by the water pressure acting upon pistons, and their capacity materially increased in this way. Definite statements of the *amount* of such increase are lacking.

In a forty-eight-inch pipe of the Boston Water Works (now of the Metropolitan system), cleaned by hand scraping and brushing in 1894 after being used sixteen years, an increase of approximately thirty-three

was obtained, practically restoring the original capacity. This pipe was about eighteen hundred feet long. The cleaning and its effects are fully described in a paper by Mr. Desmond FitzGerald, Civil Engineer, which is published in the *Journal of the American Society of Civil Engineers*.

It is impracticable to clean this pipe by hand, both on account of its size, which is not large enough to work in, and on account of its length and the time during which it must be out of use to clean it in that manner.

No pipe over twenty-four inches in diameter has been cleaned by the pressure driven piston scrapers as far as I know. I believe, however, that it is quite as feasible to clean a thirty-inch pipe in this way as a smaller one under the same conditions.

It is in my opinion of the utmost importance that this pipe should be cleaned, if possible, as it is not now delivering a sufficient quantity of water, in addition to the natural supply from Fresh Pond itself, to meet the demand by from one to two million gallons per day, and with no longer in conditions, it is a question of perhaps a year before the stored water in Fresh Pond will be exhausted.

Since making the investigation of the pipe line described above, I have been authorized by your Board to make an experiment or test upon a section of the line to ascertain if the pipe can be cleaned by scraping, how it can be done in the best way, and what results in the increase of flow may be expected if the entire line is cleaned. Six thousand dollars have been appropriated, with the understanding that approximately one thousand might be expended upon the preparation for and the making of the test. When this is done, it may be determined whether or not the appropriation will be sufficient to clean the entire length of the thirty-inch pipe. It will be unnecessary to clean the thirty-six-inch at once, although it will be desirable to do so soon, if the cleaning of the thirty-inch proves to be successful and effective.

Considerable time was necessarily consumed in the design of the apparatus, and its construction is not yet completed. It is hoped that the experiment will be made on the trial section soon, but the season is so far advanced that it will be wiser to wait until spring to clean the rest of the pipe.

The complete cleaning of the line will require some time, and will interrupt the delivery of the water from Stony Brook basin for two weeks or perhaps a month. I understand that your Board has made arrangements with the Metropolitan Water Board whereby you can obtain water from that system if there is danger of a shortage in the supply from Fresh Pond. In that case, an interruption of even a month can well be afforded

if the increase in flow is as much as I believe that we may expect. Such an increase will provide the time in which to lay new or additional pipe lines which are evidently needed.

NEED OF NEW OR ADDITIONAL PIPE LINES.

The foregoing report upon the condition of the pipe line from Stony Brook basin to Fresh Pond shows its inadequacy to supply the present consumption of more than eight and one-half millions gallons per day, and indicates the pressing need of a new or additional line, which need your Board has been pointing out in its reports for several years past.

To properly consider this question it is first necessary to ascertain the present and prospective requirements of the City.

CONSUMPTION OF WATER.

The consumption of water in the Cambridge Water Works has been as shown by the following table, which gives the population of Cambridge and the consumption of water since 1872 :—

TABLE NO. 1.

GIVING POPULATION OF CAMBRIDGE AND THE AVERAGE DAILY CONSUMPTION OF WATER IN GALLONS.

Year.	Population.	Total.	Average Daily.	Per Capita Daily.
1872	45,166	595,118,196	1,626,066	36
1873	46,807	740,151,380	2,027,812	43.3
1874	48,448	839,301,075	2,299,455	47.48
1875	50,088	890,075,860	2,718,485	54.27
1876	51,061	892,514,424	2,738,564	47.75
1877	52,033	960,582,180	2,631,732	50.57
1878	53,002	823,874,350	2,257,190	42.58
1879	53,977	887,820,890	2,432,386	45.06
1880	55,110	886,890,468	2,423,198	44.15
1881	56,470	902,319,420	2,472,108	43.77
1882	57,830	903,234,840	2,474,616	42.79
1883	59,190	980,670,320	2,686,768	45.39
1884	60,550	971,358,906	2,626,691	43.38
1885	61,910	1,125,252,660	3,082,884	49.79
1886	63,982	1,235,558,945	3,385,093	52.75
1887	66,056	1,409,411,000	3,861,400	58.45
1888	68,330	1,587,688,602	4,337,947	60.73
1889	70,204	1,599,439,125	4,382,025	59.56
1890	72,278	1,638,550,335	4,489,179	62.11
1891	75,271	1,778,056,620	4,871,388	64.71
1892	78,264	1,961,362,890	5,358,915	68.47
1893	81,257	2,307,863,975	6,322,915	75.35
1894	84,250	2,127,878,460	5,829,804	69.19
1895	83,817	2,190,781,930	6,062,142	71.65
1896	86,881	2,413,506,480	6,594,280	75.80
1897	88,786	2,441,340,095	6,688,603	76.46
1898	89,277	2,792,321,175	7,650,195	85.69
1899	88,576	2,882,570,345	7,897,453	89.16
1900	92,308	2,66,540,918	7,263,773	78.69
1901	94,355	2,785,156,590	7,630,566	80.87
1902	94,157	2,930,553,610	8,028,914	85.27

The foregoing table shows an increase not only in the total consumption but in the per capita consumption.

An increase in the total consumption is a natural result of an increasing population. A certain increase in the per capita is also a legitimate result of the generally more extended uses of water in larger places, and usually accompanies the growth of population. The important point to determine is whether the increase is wholly due to legitimate use of water or partially to waste.

The total consumption in Cambridge increased from 1,626,006 gallons per day in 1872 to 8,028,914 in 1902, or practically five and one-half per cent. per year. The rate of increase is not uniform, in fact, the consumption is less in some years than in the preceding one, but the above is the rate of increase for the period. Since 1900 the rate has been about seven per cent. per year, including 1903. In the last ten years, or since 1893, it has been only three and one-half per cent. with violent fluctuation. This is shown graphically on Diagram No. 2.

While the increase in consumption was from 1,626,006 to 8,028,914 in thirty years, or about five and one-half per cent. per year, the increase in population is from 45,166 in 1872 to 94,152 in 1903, or two and one-half per cent. per year, or approximately one-half the rate of the increase in consumption. The increase in population is shown graphically on Diagram No. 3.

The per capita consumption has increased from thirty-six gallons per day in 1872 to 85.27 in 1902, or equal to a uniform increase of about two and three-fourths per cent. per year. The increase in consumption per capita is shown graphically on Diagram No. 4.

The average daily consumption in 1902 was 8,028,914 gallons, and in ten months of 1903 it was 8,630,000 gallons or an increase of 7.7 per cent. over that of the corresponding ten months in 1902. If the same percentage of increase is maintained for the year, the total consumption in 1903 will be 3,120,000,000 gallons or 8.63 millions per day as compared with 2,930,553,610 in 1902, and 2,785,156,590 in 1901.

The daily flow from Stony Brook basin under present conditions must exceed six and one-half millions. It is not safe to estimate the yield of Fresh Pond water shed at more than two million gallons daily in a year of average rainfall, or more than one million gallons in a very dry year. This is upon the supposition that there is no important diversion of water from the water shed.

This makes a total available supply of from seven and one-half to eight and one-half million gallons per day, depending upon the amount of rainfall. As the rainfall cannot be predicted, the only sure estimate is that of seven and one-half million gallons per day.

In addition to this amount, there is available above the intake to the pump at Fresh Pond about one hundred sixty millions in storage. With

a use of 8.63 millions per day, this storage would furnish, in connection with the yield of the Fresh Pond water shed and the discharge of the pipe from Stony Brook, a full supply for one hundred forty-two days, or about four and three-fourths months, if the yield of the Fresh Pond water shed were uniform. This yield will be greater for the next six months than for the six months following, and may average two million gallons per day. This would supply the City for the next six months without drawing upon the storage. Then assuming that the yield of Fresh Pond through the six dry months will be about three hundred thousand gallons per day, the storage of one hundred sixty millions will last about ninety days, or three months. This would indicate a supply for the City at the present rate of consumption for about nine months, if the next year is a very dry one. If the year is one of average rainfall, and the use is 8.6 millions daily, the storage in the pond will probably be sufficient to supply the demand throughout the next season until the winter rains come, which would in turn keep up the supply until the next summer, or the summer of 1905.

That is, to put the matter briefly, if no change is made in the pipe capacity, the supply will run short about July or August, 1904, if the next year is a very dry one, and will run short in the summer of 1905, if the rainfall of 1904 and 1905 is about the average. This is upon the supposition that there will be no increase in the consumption over the rate for 1903. *If the present rate of increase is maintained, the shortage will come much sooner.*

It is evident that something must be done either to increase the available supply of water to Fresh Pond or to decrease the consumption of water.

The only practical method of decreasing the per capita consumption of water is by the general installation of meters. While I am of the opinion that the meter system should be adopted in Cambridge, and believe that it would, without in the least restricting a *liberal use* of water, control *needless waste* and reduce the future expenses of the water department, while not increasing the cost of the service to reasonably careful users, its installation cannot now afford relief and render unnecessary the construction of a new pipe line. Such must be built, and built as soon as possible, if a shortage of the water supply is to be averted.

Even if the proposed cleaning of the Stony Brook conduit is successful, it will do little more than to allow sufficient time to lay the new line without undue haste.

I shall refer again to the results that can be secured by the adoption of a meter system, and their probable effect upon the future of the water supply.

NEW OR ADDITIONAL PIPE LINES FOR BRINGING
WATER TO FRESH POND.

At the present time Cambridge has an abundant supply of water at the source or that could be drawn from Stony Brook and Hobbs Brook basins. The present difficulty lies in the lack of capacity in the conduit from Stony Brook basin to Fresh Pond.

The available supply at Fresh Pond can be increased by laying an additional line from Stony Brook basin to Fresh Pond to supplement the present one; by laying a new line from Hobbs Brook basin to connect with the present conduit at a point in Waltham near the Riverview Station of the Fitchburg Railroad; or by laying a new line from Hobbs Brook basin directly to Fresh Pond, following the main line of the Fitchburg Railroad from Waltham through Belmont and discharging into the northwesterly side of Fresh Pond.

The second line will increase the supply by making available the head of Hobbs Brook basin (which is one hundred feet higher than Stony Brook basin). This increased head, acting upon the present conduit below the point of connection with the new line, will increase its discharge.

Several different plans have been considered and compared. Surveys, studies and estimates have been made upon four of these.

First. A new line parallel with the present line from Fresh Pond to the end of the thirty-six-inch pipe which forms about five thousand feet of the upper end of it.

Second. A supplementary line from Fresh Pond to Arsenal Street and Irving Street in Watertown, over a different route and joining the present line there. This line avoids the summits which reduce the capacity of the present line.

Third. A new line from Hobbs Brook basin, passing north of Bear Hill and joining the present line at Riverview.

Fourth. A new line from Hobbs Brook basin directly to Fresh Pond by way of Waltham and Belmont.

CAPACITY OF NEW LINES.

In determining the capacity of new pipe lines, the future demands of the City must be considered, and also the maximum capacity of the present sources, and to a certain extent consideration must be given to possible future supplies, if they are likely to affect these lines or be affected by them. In this connection it is necessary to determine the full amount that can be expected from the present source of supply,

when it is developed to its fullest practicable extent, and the possible length of time in the future during which it will be sufficient to meet the demands of the City.

MAXIMUM AVAILABLE SUPPLY FROM PRESENT SOURCES.

I estimate that the supply available at Hobbs Brook basin, Stony Brook basin and Fresh Pond under present conditions of development is substantially twelve million gallons.

METHODS OF INCREASING THE SUPPLY FROM THE PRESENT SOURCE.

The entire water shed has an area of approximately 25.35 square miles, as measured upon the topographical maps, as follows:—

Fresh Pond water shed.....	2.14	square miles
Stony Brook water shed above Stony Brook basin and excluding Hobbs Brook and Sandy Pond*.....	15.70	" "
Hobbs Brook water shed.....	7.51	" "
Total including water surfaces.....	25.35	" "

The above area, if provided with suitable and sufficient storage capacity, is capable of furnishing a supply of nineteen million gallons per day, or at the rate of 750,000 gallons per day per square mile, through the driest periods.

The total run-off from the entire water shed is on the average approximately 27.4 million gallons per day, and the reason that only twelve millions per day is the present dry weather capacity is because of lack of storage.

On Hobbs Brook only is there storage equal to the capacity of its water shed.

I have made careful examination of the topographical maps and actual examination of the ground to ascertain if there are possibilities of increasing the storage capacity, and am of the opinion that there are but two points at which it is practicable to increase the supply from the present sources.

The first, and here it is more a question of utilizing the large storage capacity on Hobbs Brook for the flow from another water shed than of securing additional capacity, is to build a dam at the foot of Beaver Pond and divert its water to Hobbs Brook basin, as suggested in a report made by Mr. A. Fteley in 1894. I have had levels run to Beaver Pond, and find

* Sandy Pond is excluded as it is used as a supply for the towns of Lincoln and Concord.

that the present surface of the water is about six feet below the crest of Hobbs Brook dam. It would require a dam ten feet or more in height to divert the water when Hobbs basin is full. I have not made surveys to determine how much land would be flowed or how much the dam, and the pipe line or canal to Hobbs Brook basin would cost. I estimate that the increase in the supply which would be secured by the execution of this plan is about 1.6 million gallons per day in the driest years. This would provide a total supply, from the sources now in use, of 13.6 million gallons per day through a period as dry as any on record since 1875.

With especial care in the use and waste of water in very dry seasons, I believe that it is safe to say that the present sources (with the diversion of the water of Beaver Pond into Hobbs Brook basin) are capable of furnishing a supply of fourteen million gallons daily.

The second and only other point on the water shed where in my opinion there is any promise of increasing the supply by additional storage is on Cherry Brook in Weston.

There is a possibility of building a dam on this Brook at a point where the water shed above it would have an area of about three square miles. I did not feel that I was authorized to make surveys to determine the feasibility of this plan. I have, however, examined the site of the dam and possible basin. As the result of this examination I am of the opinion that the basin would be rather shallow and that, on the whole, the plan is not very promising, although possible of execution.

If the time comes, as it undoubtedly will, when the supply for Cambridge will be filtered (in common with that from other good surface sources as the result of a higher general standard for domestic water supplies), the Cherry Brook plan might be carried out, as the shallowness of the basin would not then affect the quality of the water, as it would under present conditions.

The increase in the supply to be secured by the execution of this plan would be from one to two millions per day, according to the conditions found by actual survey.

I have no data from which to estimate the cost of the development of the Cherry Brook plan.

Summarizing the above, the maximum limit of supply from the present sources, when developed to the fullest practicable extent, will not exceed sixteen million gallons daily, with a present supply of twelve millions, based upon dry years.

With the present rate of increase in the consumption of water the supply, as it is now developed, will meet the demand until about the year 1903, and the supply, when the source is fully developed, will meet it until about 1916.

This is shown in Diagram No. 2, accompanying this report, and giving graphically the total daily consumption of water since 1872, and by the projection of the same rate of increase the future daily consumption, if the rate of increase for the past thirty years is continued.

With no change in the operation of the works, I see no reason to expect a lower rate of increase in the consumption. This rate for the whole period since 1872 has been 5.475 per cent. per year. While there have been fluctuations in the increase from year to year, the above rate, in a general way, represents it very well. This is shown on Diagram No. 2 by the dotted line or curve corresponding with the rate of 5.475 per cent. increase per annum. The small circles represent the actual average daily consumption for each year, and the full line connecting them shows the actual increase. The horizontal scale of the diagram represents the years, and the vertical scale the consumption in million gallons daily.

The rate of growth in population for the past thirty years supports the opinion that the future growth will be rapid, and that a rapidly increasing consumption of water will result. Diagram No. 3 gives the population since 1872 in a graphic form. The circles represent the population of each year, the larger ones the actual population in the census years, and the smaller ones the population in the intervening years, as it has been estimated by the Water Department. The increase from 1875 to 1900 has been at the rate of thirteen per cent. in each five years. It is interesting to note how closely the dotted line which represents an increase of thirteen per cent. in five years lies to the actual population of each census year. This curve seems to represent as closely as possible the tendency of the past rate of increase, and the only safe course seems to be to project it into the future at the same rate for some years at least. There is no apparent reason for thinking that the increase in population of Cambridge is about to decrease in its rate.

The rate of increase in the consumption of water of 5.475 per cent. per year, or about thirty per cent. in five years, is higher than that of the increase in the population, which is thirteen per cent. in five years. This is explained by the increase in the rate of the per capita consumption, or the daily consumption of water by each person; that is, the consumption of water not only increases on account of the increase in population, but as the population increases the use of water per person increases.

Diagram No. 4 gives graphically the per capita consumption since 1872. The rate of this increase has been 15.55 per cent. in five years during that entire period, and the curve representing that rate is an approximate average of the increase as shown on the diagram. Without change in condition of operation this rate of increase may be expected to continue.

section is not to be increased beyond the possibilities of the present ones. If it were to be increased, it would be an economic advantage to lay a larger pipe at this time.

The cost of this line is estimated at \$320,500. It is assumed that there will be no land damages to pay, as the line will be laid alongside of the present one.

A thirty-six-inch pipe laid on the same line would cost \$410,000 and have a capacity of about nineteen and one-half millions per day instead of fifteen millions of the thirty-inch pipe.

Route No. 2. From Fresh Pond following the line of the Watertown branch of the Fitchburg Railroad to Irving Street.

This line avoids the summits that prevent a full discharge of the present thirty-inch line. It is proposed to build it of concrete as a gravity main or conduit, forty-eight-inch inside diameter. It is estimated that this line, in connection with the present thirty-inch and thirty-six-inch pipe, which will be connected with it at Irving Street, will have a capacity of about eight million gallons per day with the present line in its present condition, and 11.3 millions if it is cleaned.

The cost is estimated at about \$189,000, including land damages of damage to buildings and other structures.

MODIFICATION (a).

By laying a new thirty-inch pipe from the upper end of the concrete conduit at Irving Street parallel with the present thirty-inch pipe as far as the Waltham railroad station the discharge would be increased to sixteen millions with cleaned pipes. The cost would be increased to \$24,000.

MODIFICATION (b).

If the new thirty-inch pipe were extended to the end of the thirty-six-inch pipe, the discharge would be increased to 19.6 million gallons. The cost will be increased to about \$408,000.

Route No. 3. From Hobbs Brook basin north of Bear Hill connecting with the present thirty-inch line on Prospect Street, Waltham.

The plan of this line is to utilize the head or pressure due to the elevation of the water in Hobbs Brook basin to increase the discharge in the present line.

The line as proposed consists of a forty-eight-inch concrete conduit from Hobbs Brook basin for a distance of about nine thousand feet, or as

far as the topography affords an opportunity for a nearly level line, and of a thirty-six-inch cast-iron pipe from the end of the concrete conduit to the present thirty-inch pipe in Prospect street, a total distance of about 16,800 feet.

The capacity of this line, in connection with the present thirty-inch pipe from Prospect Street to Fresh Pond, would be about 13.6 millions per day with the thirty-inch pipe in its present condition, and seventeen millions if it were cleaned.

Water can be drawn from Hobbs Brook basin, however, to only the extent of the supply in that basin, or an average of about six million gallons, daily. As the storage capacity is very large, it may be drawn at such times as are most desirable. Used in conjunction with Stony Brook basin, drawing part of the time from the latter, preferably in the wet season, and storing in Hobbs Brook basin, and during the dry weather drawing from Hobbs Brook basin, an average daily supply in dry years of about eleven million gallons can be discharged into Fresh Pond. I estimate that the supply of Fresh Pond and its water shed is about one million per day in dry years, making a total available supply of twelve million gallons daily, or just about the supply from all sources under the present development.

To secure this result, water must be drawn from Hobbs Brook basin for about four and one-half months at the rate of seventeen million gallons per day, and from Stony Brook basin for about seven and one-half months at the rate of eight million gallons. Both of the above quantities are dependent upon having the present pipe line cleaned.

If it were not cleaned, the supply that the pipe lines could deliver at Fresh Pond, under the best management, would be about 9.4 million gallons per day, coming in the following way: 13.6 million gallons per day for a little more than five months from Hobbs Brook basin, and six million gallons per day for a little less than seven months from Stony Brook, making a total, including the supply from Fresh Pond itself, of 10.4 millions. The cost of this line is estimated at \$208,169.

There is an advantage in this route that is not shared by Routes 1 and 2. This advantage lies in the fact that water can be supplied directly to Fresh Pond from Hobbs Brook basin without passing through Stony Brook basin or being mixed with the water from the rest of the water shed of Stony Brook.

This would prove very desirable in case of an epidemic of disease, such as typhoid fever, on that part of the water shed. As it is more thickly populated there than on Hobbs Brook water shed, there is greater likelihood of such an epidemic. If one should occur, the City could be supplied through this line from Hobbs Brook until the danger was past.

Route No. 2. From Hobbs Brook basin north of Bear Hill through School Street in Waltham and along the main line of the Fitchburg Railroad to Fresh Pond.

This line will consist of about nine thousand feet of thirty-six-inch concrete conduit on the same location as the forty-eight-inch concrete conduit proposed for Route No. 3, from the end of the concrete section a twenty-four-inch cast-iron pipe through the fields to Main Street in Waltham, following to this point the line of the proposed thirty-six inch cast-iron pipe in Route No. 3. It will then follow Main and School Streets in Waltham to the Fitchburg Railroad near Beaver Brook station, hence, generally by the Fitchburg Railroad, to Belmont, thence by way of Concord Avenue to Fresh Pond.

The plan for this route is for an entirely independent line from Hobbs Brook basin to Fresh Pond. The capacity of this line as proposed is about ten and one-half million gallons per day.

The total average capacity of Hobbs Brook basin (including therein the water of Beaver Pond and its water shed after it may be diverted) is about 7.6 million gallons per day. It seems desirable, however, to have a margin in the capacity of this line over the average capacity of the Hobbs Brook supply, as at times it may be desirable to draw water from this source at a greater rate than the average. This route has the same sanitary advantage as Route No. 3 of being able to supply water from Hobbs Brook basin unmixed with that from other parts of Stony Brook water shed in case of an epidemic of disease. At such times it would be desirable to draw at a greater rate than the average capacity of the Hobbs Brook supply.

Although the capacity of this pipe line is less than that of Route No. 3, the total capacity of all the lines will be greater with this route than with any of the others on account of the fact that this and the present line can be used simultaneously, this line delivering water from Hobbs Brook, and the present line from Stony Brook. With this line the total daily capacity of the lines will be approximately as follows with the pipes cleaned:—

Present line.....	8 million gallons
Route No. 3.....	10.5 " "
Total.....	18.5 " "

This refers, of course, only to the capacity as measured by the pipe line and exceeds the estimated total capacity of the present sources, now fully developed, by two or three millions per day.

The cost of this line is estimated at \$335,122.

MODIFICATION (a).

Route No. 3 can be modified by connecting it with the present thirty-inch line by a twenty-four-inch pipe through Newton Street in Waltham from Main Street to the thirty-inch in River Street, omitting for the present the laying of the twenty-four-inch from Waltham to Fresh Pond. The line, with this modification, would be used in the same way as that of Route No. 3, that is, drawing from Hobbs Brook a portion of the time and from Stony Brook the remainder. The capacity of the line, while drawing from Hobbs Brook basin, would be twelve million gallons, and with careful management the total average capacity of the lines would be ten million gallons daily, making, with Fresh Pond, a total supply of eleven million gallons. The estimated cost is \$174,500.

When it becomes necessary to have greater capacity, the line can be extended through Belmont to Fresh Pond as originally proposed. The connection to the present line would add about \$7,500 to the final cost. It might be worth its cost, if at some time in the future it becomes desirable to draw large quantities from Hobbs Brook basin alone during the prevalence of disease on the rest of the water shed. The final line will not be required until about 1908, if the present increase in consumption of water continues, and thus the interest on the difference in cost of the full and partial line will be saved for that time, amounting to from \$25,000 to \$30,000.

SUMMARY.

The following is a summary of the capacity and cost of the various lines :—

PIPE LINE.	ESTIMATED COST.	ESTIMATED DAILY CAPACITY IN GALLONS.	
		With Present Line Cleaned.	With Present Line in Present Condition
By Route No. 1.....	\$320,500 00	15,400,000	11,500,000
" " " 2.....	188,975 00	11,300,000	8,000,000
No. 2, Modification (a).....	342,600 00	16,000,000	.....
" " " (b).....	407,912 00	19,600,000	.....
By Route No. 3.....	208,169 00	11,000,000	9,400,000
" " " 4.....	338,935 00	18,500,000	16,500,000
No. 4, Modification (a).....	174,497 00	10,000,000	8,800,000

The above estimates of capacity refer only to pipe line capacity, and do not include the supply from Fresh Pond itself, which will add one million gallons per day to them, except when they exceed the full amount of

the supply, which is at present twelve million gallons per day, and may be increased to sixteen millions with full development of the water shed.

NOTE. All estimates of capacity are based upon *cleaned* pipe, not *clean new* pipe, which would have a greater capacity than that given. All new lines will be provided with suitable entrance structures or manholes for the insertion of scrapers.

Detailed estimates of the cost of each line are annexed to this report. These estimates include a sum for land damages, rights of way, &c., which, while not an exact or an expert estimate of such costs, is believed to be sufficient to cover them. This is, however, a matter of much uncertainty, and the estimate might be exceeded in this respect, and this point should be considered when making appropriations. The estimates are based upon ordinary contract prices for such work.

The different routes are shown in a general way upon a plan accompanying this report. While the estimates are based upon the locations shown, the exact location may be changed, and in some cases further careful study for the final location may show that a saving in cost may be effected by such changes.

RECOMMENDATION OF ROUTE.

The advantages and capacities of some of these lines are so nearly balanced that the selection of the best one is rendered rather difficult. By again considering some of the requirements the question may become clearer.

First. The line selected should either be of sufficient capacity in conjunction with the present line to deliver about sixteen million gallons (the full future supply of present sources) or should be capable of being developed or extended to that amount at a cost proportionate to the additional amount required.

Second. It is desirable in selecting a route for present construction to provide for the separate delivery of the water of Hobbs Brook basin to Fresh Pond on account of sanitary reasons as already explained.

Third. It is desirable if possible, without materially increased present expense, to select a route that will not only provide for the delivery of the entire future supply from the present sources, but will give the best opportunity for future increase in capacity in case a further supply (than that which can be secured from present sources) should be obtained in the same general direction, thus eventually requiring the discharge of a much greater quantity along the same general lines.

Route No. 1 very nearly satisfies the first requirement, does not satisfy the second, and will by the laying of a second pipe alongside the

present one practically prevent the increase in future capacity demanded by the third, by monopolizing the natural route for a future line. Its cost is not so low in comparison that its adoption is made desirable on that account.

Route No. 2, while having sufficient capacity for several years, has not enough for the probable future of this source, and does not satisfy the first requirement, neither does it satisfy the second.

By extension according to Modification (a) or (b), the first requirement would be met, but at a larger cost than that of any other route proposed. The second requirement would not be met, and the relation of the line to the third would be the same as of Route No. 1, so that this requirement would not be satisfied.

Route No. 3 does not satisfy the first requirement without an extension, which would make it more expensive in the end than Route No. 4. It satisfies the second one, also the third, by leaving the line of the present pipe open for a second line of any size that the future shall show to be necessary.

Route No. 4 satisfies all three of the requirements. Its first cost is greater than that of Route No. 3, but not so great as that would be when extended to have a capacity in connection with the present pipe equal to the full future capacity of the source, or about sixteen millions daily. Its cost is not so great as that of any of the other routes having a capacity equal to the full supply. It will not need the careful management required by Route No. 3 of alternate drawing of water from Hobbs Brook basin and from Stony Brook basin in suitable quantities and at a proper time to insure its full total delivery.

By the modification suggested in Route No. 4 of laying the pipe only to Newton Street at present, and connecting with the present thirty-inch line, it will have nearly the same present capacity as Route No. 3. It will have to be managed in the same way as the latter, and its present cost will be but \$175,000, or a present saving of \$160,000, which would not have to be expended for four or five years, during which time the saving in interest alone would be from \$25,000 to \$30,000.

In view of the above, I recommend Route No. 4 as the best one for a new pipe line. It is probably a matter for other than strictly engineering judgment whether it will be the better policy to lay the entire line at once or to adopt for the present the modification suggested.

With that modification it would undoubtedly meet the demands until about 1908, and if for any reason the future increase in consumption should be less rapid than the past, until a later date. The adoption of a meter system would probably render its capacity sufficient until 1914, as shown later in this report.

METERS.

To make the consideration of the foregoing matter complete, it seems essential that an examination of the question of a general adoption of the meter system be made, in its relation to the present supply and its further development, and the policy to be pursued in building new pipe lines.

While the consumption of water in Cambridge is not large, compared with many cities of its size, which sell water by fixture rates, it is large compared with all places where a large percentage of the services are metered.

It must, of course, be considered that quite a large part of the total consumption in Cambridge is used for manufacturing purposes, a larger proportion than in most places. This part of the supply is already metered, and no reduction in it can be expected. The water used for manufacturing in 1902, as nearly as I can ascertain, was about 760,000,000 gallons, or twenty-six per cent. of the total. The per capita use for manufacturing was about twenty-two gallons per day out of a total of 45.27, leaving sixty-three gallons per capita for all other uses.

I believe that the loss from the street mains and services is very small and that if there is any important waste of water it is within the houses of the consumers.

The following table gives the per capita consumption in the larger cities of the State in which seventy-five per cent. or more of the services are metered for the year of 1900:—

Name of Place.	Population.	Per cent. of Metered Service.	Consumption Per Capita.
Dorchester	45,000	92	39 gallons
Fall River	304,000	94	36 "
Lynn	92,500	77	35 "
Boston	52,500	90	32 "
Worcester	110,411	94	69 "
Providence	.....	..	45.5 "
Waltham	.....	..	65 "
Quincy	.....	..	29 "

In the City of Worcester, which has the largest per capita consumption of any in the above list, it is sixty-nine gallons as against eighty-five in Cambridge. The use of water for manufacturing purposes in Worcester is also very large, being over forty-two per cent. of the total in 1902, as compared with twenty-six per cent. in Cambridge.

I do not wish to overload this report with detail and comparison. I have, however, made a careful study of this question and of the experience in metered places, and believe that if meters were placed upon

seventy-five per cent. of the services in Cambridge (including those now metered) the per capita consumption could be reduced at least fifteen gallons from the present rate, and that by 1905 the per capita consumption would not exceed seventy-four gallons instead of ninety-one, as it will be if it continues to increase as it has in the past. I believe that the future increase in the per capita consumption would be very largely checked by meters.

Diagram No. 4 gives the future per capita consumption as I estimate it, if seventy-five per cent. of the services were to be metered. The diagram shows the amount per capita that is estimated for leakage from reservoirs, mains and service pipes, for manufacturing, for domestic and public uses, and the total. All of the estimates are based upon data which, although incomplete, furnish an indication of the results to be expected. I believe this estimate of future per capita consumption under a system of meters is too large rather than too small.

Diagram No. 4 also gives the future per capita consumption projected on the rate of the past thirty years. The divergence between the estimate with meters and that without is very marked. A curve of future total daily consumption with meters is given on Diagram No. 2 for comparison with the curve of future consumption obtained by projecting the rate of increase of the past thirty years.

Both are based upon future growth in population at the same rate as that of the past thirty years.

The following table gives in figures the estimate of the future population and the daily consumption of water with and without meters each five years. The figures are taken from Diagrams 2 and 3:—

ESTIMATE OF FUTURE POPULATION AND CONSUMPTION OF WATER.

YEAR.	POPULATION.	DAILY CONSUMPTION OF WATER IN GALLONS.	
		Without Meters.	With Meters.
1905	104,800	9,434,000	7,730,000
1910	117,800	12,312,000	9,670,000
1915	133,200	16,068,000	11,660,000
1920	150,500	20,850,000	14,150,000
1925	170,000	27,150,000	16,820,000
1930	192,200	35,300,000	29,900,000

These estimates of consumption show that the supply, as developed at present (of twelve millions daily) will meet the demand until about 1910 without meters and until about 1916 with meters. The entire probable supply from present sources (of sixteen millions daily) will be sufficient until 1915 without meters and until 1923 with meters.

There were in 1902 14,569 services, and if the increase of the past year continues, there will be about 15,000 in 1905. To meter seventy-five per cent. of these services will require 11,250 meters. In 1902 there were 2,113 meters already set, leaving 9,137 additional meters to be installed and maintained. I estimate that the total annual cost of maintaining these meters will average \$2.15 each. This includes interest on cost, a sinking fund to renew the meters in sixteen years, repairs, care, reading and inspection. The total annual cost in 1905 for the meters will be \$19,645 with about \$260 additional each year for the annual increase in number of meters.

To determine approximately the economic effect of the general adoption of meters, I have made estimates of the additional annual expense caused by meters and the annual saving due to their use. This saving will consist in the cost of the coal saved on account of pumping a smaller quantity of water, the interest, depreciation or sinking fund and maintenance on new construction during the term which such construction can be postponed on account of the use of meters.

In these figures I have assumed that the construction of the lower part of the line on Route No. 4 would be postponed until required, which would be in 1908 without meters and in 1914 with them. I have estimated that the entire development of the present sources would be required in 1915 without meters and in 1923 with meters.

I have made estimates upon two methods of meeting the demand when the full capacity of the present source is reached, one upon a development of a supply from the head waters of the Shawabehn River, and the other upon the entrance into the Metropolitan system. While the estimate of annual expenses under either system cannot be considered as being very close, I believe that in neither of them has there been any discrimination in favor of the meter system, but the determination of doubt has been the other way or against that system.

This I believe is the case all through, that is, the reduction in consumption due to meters is underestimated, and the amount of the annual saving is also underestimated. This is perhaps no more than safe, as the meters should make out a sure case, if the expense of their installation is to be undertaken.

The following tables give the results of my estimates, and show what I believe may be fairly expected.

Table A is based upon a supposed development of a supply from Shawabehn River when the capacity of the present source is reached, and Table B upon entrance into the Metropolitan system.

Incidentally these tables give the comparative cost of securing the future supply by these two methods, according to my present rough estimate.

Column 5 of these tables gives the total annual saving due to use of meters; Column 6 gives the annual cost of the meter system; Column 7 gives the annual gain or loss due to the system; Column 8 gives the accumulated or net gain or loss at any time.

TABLE A.

GIVING ECONOMIC RESULTS OF THE USE OF METERS.

Year.	Annual saving in consumption of water by use of meters. Million gallons.	Annual saving in cost of coal by use of meters.	Annual saving in interest and sinking fund by use of meters.	Total annual saving by use of meters.	Additional annual cost of meters.	Annual gain or loss by use of meters.	Accumulated
1	2	3	4	5	6	7	
1905	640	\$1,715	.....	\$1,715	\$19,645	-\$17,930	.....
1906	690	1,849	.....	1,849	19,905	-18,056	-\$1
1907	753	2,026	.....	2,026	20,165	-18,139	.....
1908	870	2,331	\$9,600 ¹	11,931	20,425	-8,494	.....
1909	920	2,468	9,600	12,068	20,685	-8,617	.....
1910	1,040	2,780	9,600	12,380	20,915	-8,565	.....
1911	1,090	2,920	34,600 ²	37,520	21,205	-16,315	.....
1912	1,192	3,194	34,600	37,794	21,465	-16,329	.....
1913	1,334	3,574	34,600	38,174	21,725	-16,449	.....
1914	1,440	3,860	25,000 ³	28,860	21,985	-6,875	.....
1915	1,560	4,180	25,000	29,180	22,245	-6,935	.....
1916	1,726	4,630	95,000 ⁴	99,630	22,505	-77,125	.....
1917	1,897	5,085	70,000 ⁵	75,085	22,765	-52,320	.....
1918	2,080	5,575	70,000	75,575	23,025	-52,550	.....
1919	2,260	6,070	70,000	76,070	23,285	-52,785	.....
1920	2,420	6,480	70,000	76,480	23,545	-52,935	.....
1921	2,625	7,040	70,000	77,040	23,805	-53,235	.....
1922	2,902	7,780	70,000	77,780	24,065	-53,715	.....
1923	3,125	8,380	70,000	78,380	24,325	-54,055	.....
1924	3,420	9,160	.....⁶	.....	24,585	.....	.....

¹ Route No. 4 must be finished this year to supply the consumption without meters.

² Full development of water shed must be made this year for supply without meters.

³ Route No. 4 must be finished this year for use with meters.

⁴ Further supply must be developed this year for use without meters.

⁵ Full development of water shed made this year for use with meters.

⁶ Further supply must be secured this year for use with meters.

TABLE B.

GIVING ECONOMIC RESULTS OF THE USE OF METERS.

Annual saving in consumption of water by use of meters. Million gallons.	Annual saving in cost of coal by use of meters.	Annual saving in interest and sinking fund by use of meters.	Total annual saving by use of meters.	Additional annual cost of meters.	Annual gain or loss by use of meters.	Accumulated gain or loss by use of meters.
1	2	3	4	5	6	7
840	\$4,715	-----	\$4,715	\$19,445	-\$17,000	-----
900	1,949	-----	1,949	19,305	-19,056	-\$35,000
1,000	2,090	-----	2,090	20,165	-19,120	-54,120
1,100	2,211	\$9,000	11,211	20,425	-8,494	-62,614
1,200	2,405	9,000	11,405	20,690	-8,677	-71,291
1,300	2,700	24,000	26,700	20,945	-8,005	-79,296
1,400	2,880	24,000	26,880	21,206	-14,326	-93,622
1,500	2,784	24,000	26,784	21,405	-14,621	-108,243
1,600	2,714	24,000	26,714	21,725	-14,449	-122,692
1,700	2,800	25,000	27,800	21,990	-4,941	-127,633
1,800	4,100	25,000	29,100	22,245	-4,005	-131,638
1,900	4,630	140,000	144,630	22,500	+129,130	+111,193
2,000	5,005	124,000	129,005	22,750	+106,255	+217,448
2,100	5,275	127,000	132,275	23,005	+109,270	+326,718
2,200	5,500	131,000	136,500	23,255	+113,245	+440,000
2,300	5,670	134,500	140,170	23,505	+116,665	+557,365
2,400	5,780	137,500	143,280	23,755	+119,525	+678,890
2,500	5,830	140,500	146,330	24,005	+122,325	+803,215
2,600	5,880	143,500	149,380	24,255	+125,125	+930,340
2,700	5,930	146,500	152,430	24,505	+127,925	+1,059,265

Source No. 4 must be finished this year to supply the consumption without meters.
Full development of water shed must be made this year for supply without meters.
Source No. 4 must be finished this year for use with meters.
Metropolitan service goes on this year for use without meters.
Full development of water shed made this year for use with meters.
Metropolitan service goes on this year for use with meters.

Table A shows that the cost will be greater with the meter system without until the year 1915, when the net deficit caused by it will cost \$17,000. In the following year, however, this is changed to a gain of \$60,000 due to the increase in the expense account caused by introduction of a further supply which will be required at this time fens are not used.

The net gain by 1924, the time when a further supply must be introduced to meet the demands if meters are used, is shown to be \$431,822.

As already stated, the results of these tables are based upon securing their supply from the Shawsheen River.

If this were not possible or desirable, and it became necessary to the Metropolitan system to secure a suitable supply, Table B gives results of the use of meters under these conditions.

In 1915 the net loss by use of meters would be about \$17,000. In this is changed to a net gain of \$111,193, and in 1924 a net gain of 2,263 is shown.

The results in the tables show that a large saving will be made eventually by the use of meters.

While this is true as a final result, it may be said that the result for the next ten or twelve years is a net loss, and that the proper policy is to postpone the adoption of meters until the gain by their use would equal their cost of maintenance, or until 1910 or 1911 as shown in Column 7.

This reasoning, however, is not sound, as meters cannot be installed and their benefit secured in one year. It is neither desirable nor economical to install as many meters in so short a time. The best plan is to introduce them gradually as the result of a settled policy and in accordance with the information gained by study of the consumption in different locations and classes of service, and of results obtained by meters previously set.

I am of the opinion that five years is none too long a time for the installation of as many meters as will finally be desirable in Cambridge, and that if a meter system is to be adopted a beginning should soon be made and a certain proportion of the meters be set each year.

With a careful study of the consumption in different localities, and among different classes of consumers, and an intelligent application of meters in accordance with the result of such study, I am of the opinion that the metering of only twenty-five per cent. of the services now unmetered, or the setting of three thousand meters in addition to those now in use, will result in a marked decrease in the per capita consumption, and will clearly show the desirability of still further extending the system.

It may be somewhat misleading to use the term "decrease in per capita consumption" in this connection, as it is not in any way the purpose, in advocating the general installation of meters, to restrict the actual *use* of water by the individual consumer, but to curtail the waste that is constantly going on by reason of leaking fixtures.

This waste does not contribute in any way to the convenience, comfort or luxury of the consumer, but is simply useless in every respect. It can be inexpensively reduced or stopped entirely by a reasonable amount of care and attention to the plumbing fixtures.

The meter system, while allowing latitude for an abundant, and even lavish, *use* of water, tends to automatically restrict the *waste* by calling the consumer's attention to it through an increase in the quarterly bills, and making it for his own interest to see that all fixtures are practically tight.

This waste of water in the house is entirely under the control of the consumer, and the water department is powerless to restrict it, except by the use of meters.

It is no doubt unnecessary to make the foregoing explanation to your board, as it has already recommended in its annual reports the extended use of meters.

There are those, however, who seem to believe sincerely that the use of meters means the restriction of the use of water, and is, therefore, undesirable from the standpoint of comfort and sanitation.

There is really no foundation for this belief, as may be seen from the results in the increasing number of metered works, where the per capita consumption is very much less than in unmetered works of the same class, and where there is no complaint from any one of being in any way limited in the use of water.

In concluding this report it seems proper to state that, in view of the results of my investigations of the pipe line, as given above, I believe that no time should be lost in adopting all practical means of restricting consumption, and of increasing the supply by cleaning the present pipe line, if it is found practicable to do so in order that sufficient time may be secured in which to properly prepare for the laying of the necessary additional pipe line and its construction in an economical manner without undue cost. That your Board appreciates that immediate preparation should be made for the construction of an additional pipe line is shown by the fact that in four successive annual reports it has called attention to this matter, and recommended action upon it. It is therefore unnecessary for me to further emphasize the present condition as shown by the results of my investigation into the discharging capacity of the pipe line from my Brook basin to Fresh Pond, as given in the foregoing report.

Respectfully submitted,

(Signed) FREEMAN C. COFFIN.

ROUTE No. 1.

ESTIMATE OF COST.

34,000 feet 30-inch pipe, at \$7.25		\$244.5
6 30-inch gates and chambers		2.4
10 manholes and blow-offs		3.0
Connection with present pipe and meters		2.5
Other special castings		2.0
		<u>\$256.4</u>
Add 25 per cent. for engineering and contingencies		64.1
		<u>\$320.5</u>

ROUTE No. 2.

ESTIMATE OF COST OF LINE FROM IRVING STREET, WATERTOWN
FRESH POND.

16,105 cubic yards earth excavation, 0 to 7 feet deep, at \$ 60		\$966.3
7,815 " " " " 7 to 14 " " at 1 00		7.8
625 " " " " 14 to 21 " " at 1 50		9
1,841 " " " or rock in tunnel . . at 10 00		18.4
845 " " rock excavation . . . at 5 00		4.2
776 " " " " 7 to 14 feet deep, at 6 00		4.6
115 " " " " 14 to 21 " " at 7 00		8
18 " " " " 21 to 25 " " at 8 00		1
		<u>\$46.3</u>
12,350 feet 48-inch concrete conduit . . . at 4 50		55.6
150 feet 48-inch C. I. pipe . . . at 11 00		1.6
Connection at Irving Street, 2-30-inch to 48-inch		1.0
4 30-inch gates . . . at 275 00		1.1
Entrance chambers		1.0
Outlet into Fresh Pond		2.0
Restoring street surfaces		1.4
Gate and manhole chambers		6
		<u>\$111.1</u>
Add 25 per cent. for engineering and contingencies		27.7
		<u>\$138.9</u>
Add land damages and damage to buildings		50.0
		<u>\$188.9</u>

ESTIMATE OF COST OF ADDITIONS OR MODIFICATIONS TO ROUTE No.

30-Inch Cast Iron Pipe.

(a) FROM IRVING STREET TO WALTHAM STATION.

16,000 feet 30-inch pipe at \$ 7 25		\$116.0
4 30-inch gates and chambers at 400 00		1.6
6 blowholes and blow-offs at 300 00		1.8
Connections with present pipe and meters		2.5
Other special castings		1.0
		<u>\$122.9</u>
Add 25 per cent.		30.7
		<u>\$153.6</u>

36-Inch Cast-Iron Pipe.

FROM IRVING STREET TO THE THIRTY-SIX-INCH PIPE.

8 feet 36-inch pipe	at \$ 7 25	\$165,750 00
36-inch gates and chambers	at 400 00	2,000 00
manholes and blow-off	at 200 00	2,400 00
Connections with present pipe and meters		2,900 00
Other special castings		1,800 00
		<hr/> \$175,150 00
Add 25 per cent.		43,787 50
		<hr/> \$218,937 50

Either of the above estimates must be added to the cost of Route No. 2 (or 977) to ascertain the total cost in each case.

ROUTE No. 3.

ESTIMATE OF COST.

Concrete Conduit 8,900 Feet Long.

excavate yards earth excavation	0 to 8 feet deep, at	\$ 50	\$4,450 00
" " " "	8 to 14 " "	at 1 00	1,440 00
" " " "	14 to 20 " "	at 1 25	465 00
" " " rock	0 to 8 " "	at 4 00	7,200 00
" " " "	8 to 14 " "	at 6 00	2,520 00
" " " "	14 to 20 " "	at 7 00	294 00
8 feet 48-inch concrete conduit	" "	at 4 50	40,050 00
			\$41,894 50

7,800 Feet 36-Inch Cast-Iron Pipe.

cu. yds. earth excavation, 0 to 8 ft. deep, at \$ 50	\$4,500 00	
" " " " 8 to 14 " " at 1 00	1,440 00	
" " " " rock " 0 to 8 " " at 4 00	5,280 00	
" " " " " 8 to 14 " " at 6 00	2,684 00	
" " " " " 14 to 20 " " at 7 00	1,200 00	
" " " " " 20 to 24 " " at 8 00	320 00	
7,800 feet 36-inch pipe	at 50 00	48,000 00
36-inch gates and chambers	at 450 00	1,800 00
manholes, blow-offs and chambers	at 275 00	1,500 00
dig and lay 7,800 feet 36-inch pipe	at 1 50	11,700 00
all castings		4,000 00
		<hr/>
		\$82,324 00
and connection at Hobbs Brook basin		12,000 00
section at Riverview with present conduit		1,000 00
		<hr/>
		\$95,324 00
Add 25 per cent. for engineering and contingencies.		23,831 00
		<hr/>
		\$119,155 00
Add for land damages, rights of way, etc.		10,000 00
		<hr/>
		\$129,155 00

ROUTE No. 4.

ESTIMATE OF COST.

Concrete Conduit 8,900 feet long.

13,270 cubic yards earth excavation, 0 to 8 feet deep, at \$	50	.	\$6,635 00
2,988 " " " " 8 to 14 " " at	90	.	2,644 20
303 " " " " 14 to 20 " " at	1 25	.	378 75
1,414 " " rock " 0 to 8 " " at	4 00	.	5,656 00
826 " " " " 8 to 14 " " at	6 00	.	1,356 00
84 " " " " 14 to 20 " " at	7 00	.	238 00
			<hr/>
			\$17,747 96
8,900 lineal feet 36-inch concrete conduit . . . at	3 50	.	31,150 00
			<hr/>
			\$48,897 96

Cast Iron Pipe Line.

34,150 feet 24-inch pipe, laid at \$5 00 complete, . . .	\$170,750 00	
2,000 cubic yards rock excavation, at \$4.00, . . .	8,000 00	
10 24-inch gates and chambers, . . .	3,000 00	
10 manholes and blow-offs, . . .	2,500 00	
Meter and connection, . . .	1,500 00	
Gate-house and outlet at Fresh Pond, . . .	2,500 00	
Intake and connection at Hobbs Brook, . . .	6,000 00	
Special castings, . . .	4,000 00	
		<hr/>
		\$198,250 00
Add 25 per cent. for engineering and contingencies, . . .		\$247,147 96
		<hr/>
		61,786 96
		<hr/>
Land damages, rights of way, etc., . . .		\$308,934 94
		<hr/>
		30,000 00
		<hr/>
		\$338,934 94

ROUTE No. 4.

MODIFICATION (a) CONNECTED TO PRESENT LINE AT NEWTON STREET

Estimate of Cost.

8,900 feet concrete conduit, same as in estimate of Route No. 4 . . .	\$48,896 00	
12,500 feet 24-inch pipe, laid, at \$4 80 . . .	\$60,000 00	
1,800 yards rock, at \$4.00 . . .	7,200 00	
5 24-inch gates and chambers at \$300 00 . . .	1,500 00	
5 manholes and blow-offs . . .	1,250 00	
Intake and connection at Hobbs Brook . . .	6,000 00	
Special castings . . .	2,000 00	
Connection with 30-inch at Newton Street . . .	750 00	
		<hr/>
		78,700 00
		<hr/>
		\$127,596 00
Add 25 per cent.		31,899 00
		<hr/>
		\$159,497 00
		<hr/>
Land damages, rights of way, etc.		15,000 00
		<hr/>
		\$174,497 00

CAMBRIDGE WATER WORKS

DIAGRAM NO 1

SHOWING METERED FLOW THROUGH PIPE
LINE FROM STONY BROOK TO FRESH POND

1903

A companying Report of
Freeman C. Coffin

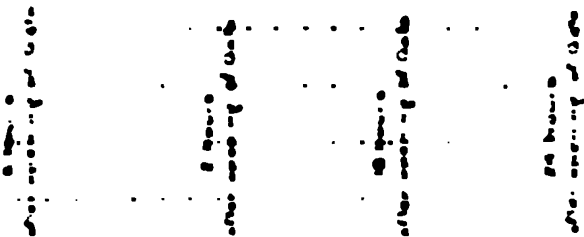
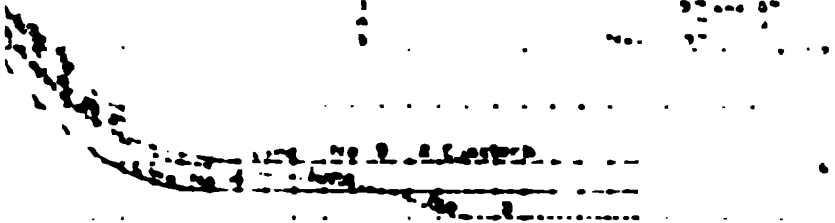
showing the Metered Flow

Aug 20

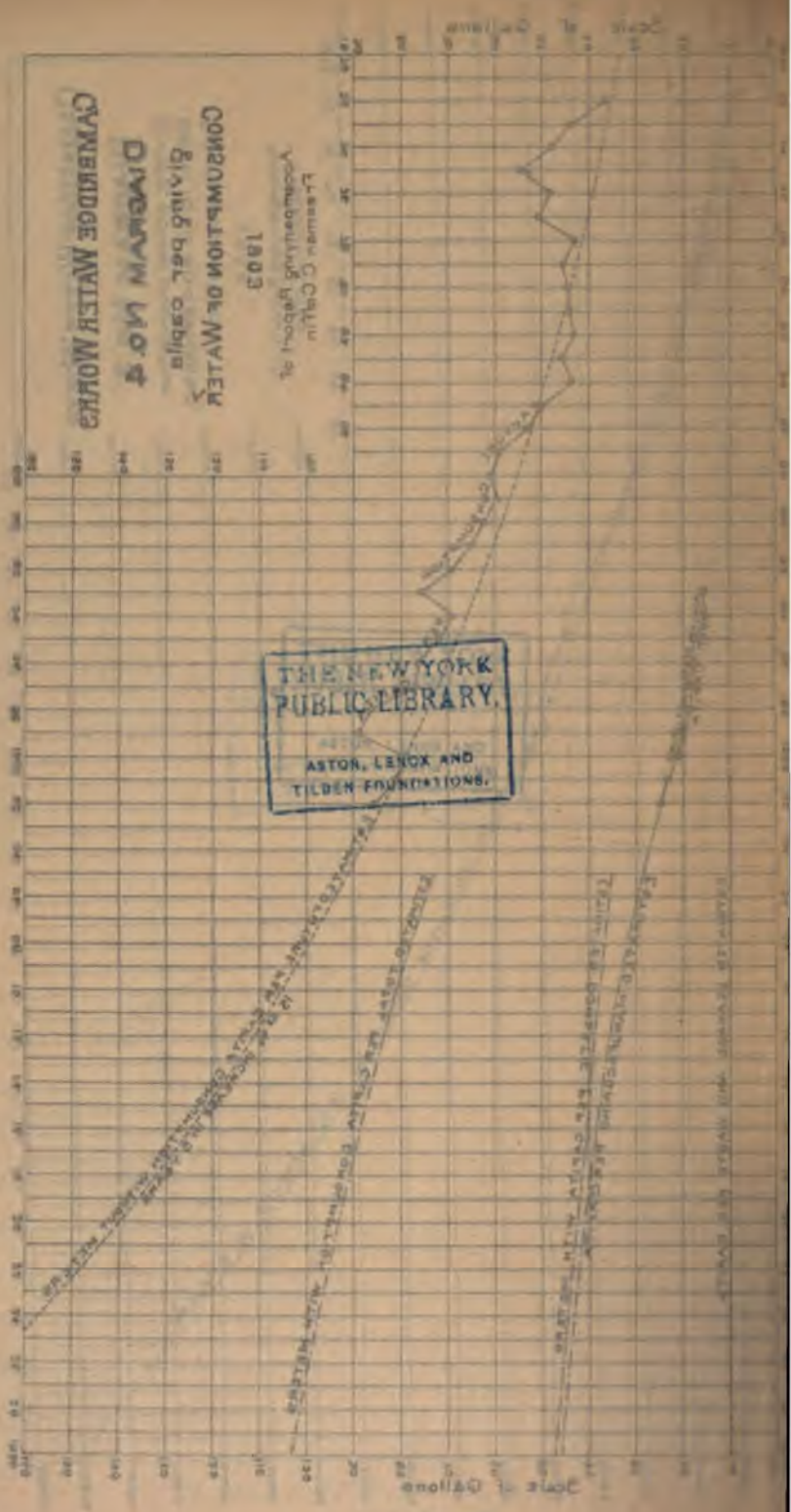
Sept 10

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Scale of Meters



THE WATER WORKS

GENERAL PLAN

Location of the Works

PIPE LINE

for

WATER TO THE CITY.

Scale

1:10,000

1908

A.
B.

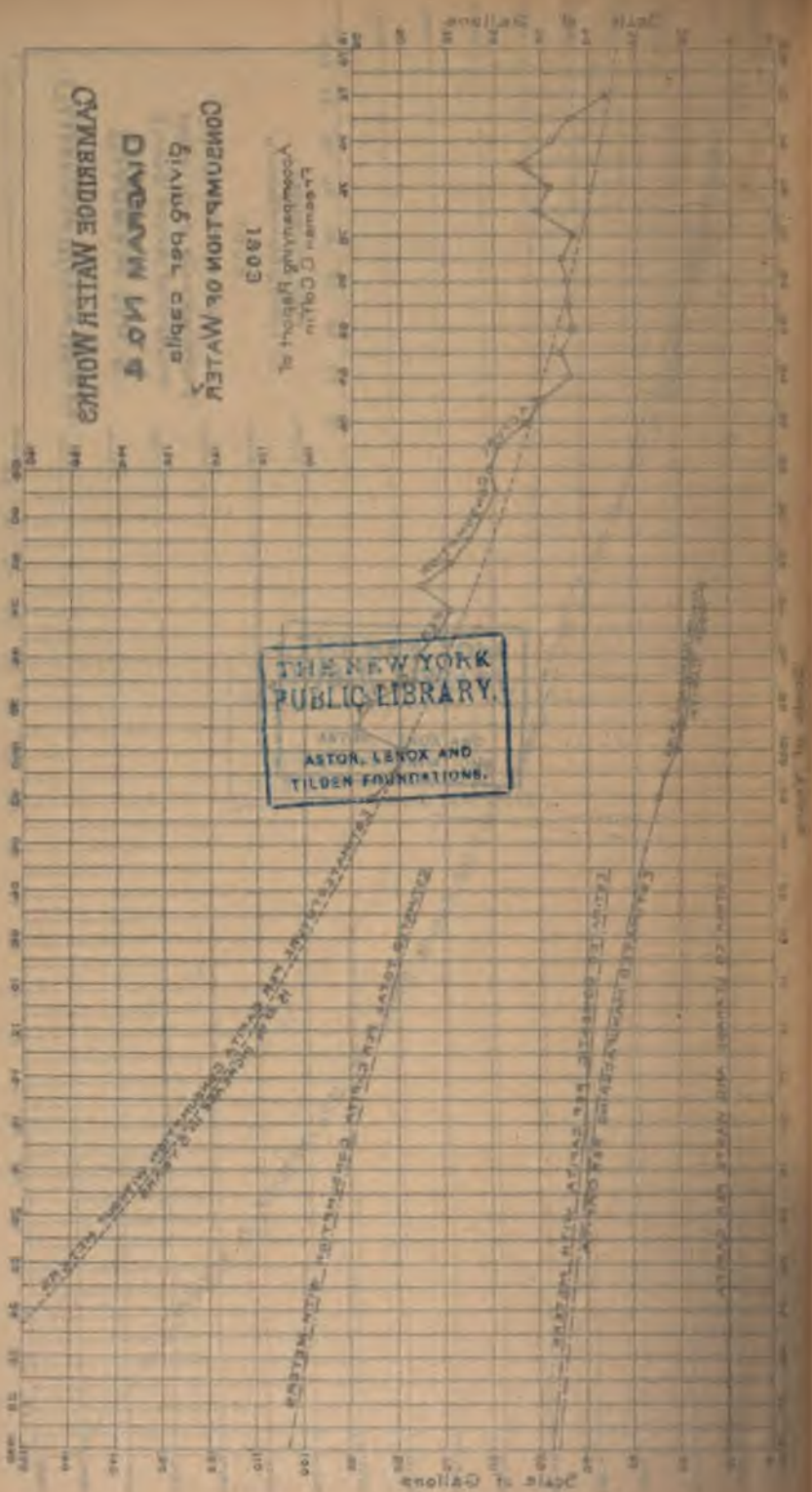
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THE WATER WORKS

GENERAL PLAN

Location of the Works

PIPE LINE

for WATER TO THE TOWN

Scale



1903

A.

B.

C.



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City of Cambridge

MASCHENMETS

CONSUMPTION OF WATER
GIVING PER CAPITA
DIAGRAM NO. 4
CAMBRIDGE WATER WORKS

1903

Prepared by
L. C. Coffin
Superintendent of the
Cambridge Water Works



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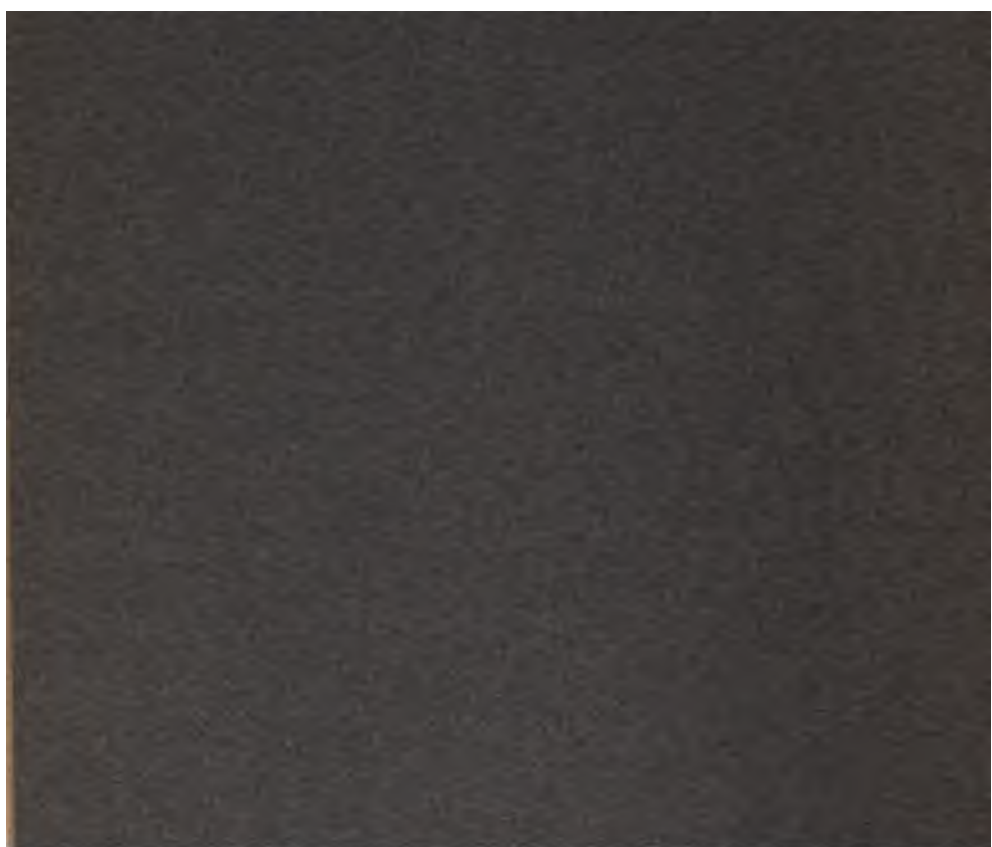
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THE WATER BOARD



104
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City of Cambridge
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ANNUAL REPORT

OF THE



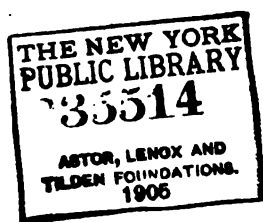
WATER BOARD

FOR THE

YEAR ENDING NOVEMBER 30, 1904



PRINTED FOR THE DEPARTMENT



CAMBRIDGE WATER BOARD

1905

President

WILLIAM B. DURANT

Members of the Board

GEORGE H. HOWARD	Term expires 1905
WILLIAM B. DURANT	Term expires 1906
ANDREW T. BABY	Term expires 1907
J. BEN E. O'BRIEN	Term expires 1908
EDMUND H. STEVENS	Term expires 1909

WALTER H. HARDING, Clerk

Superintendent of Works

EDWIN C. BROOKS

Water Registrar

WALTER H. HARDING

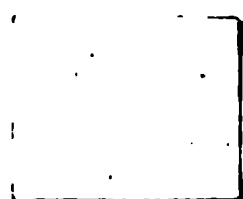
CAMBRIDGE WATER BOARD

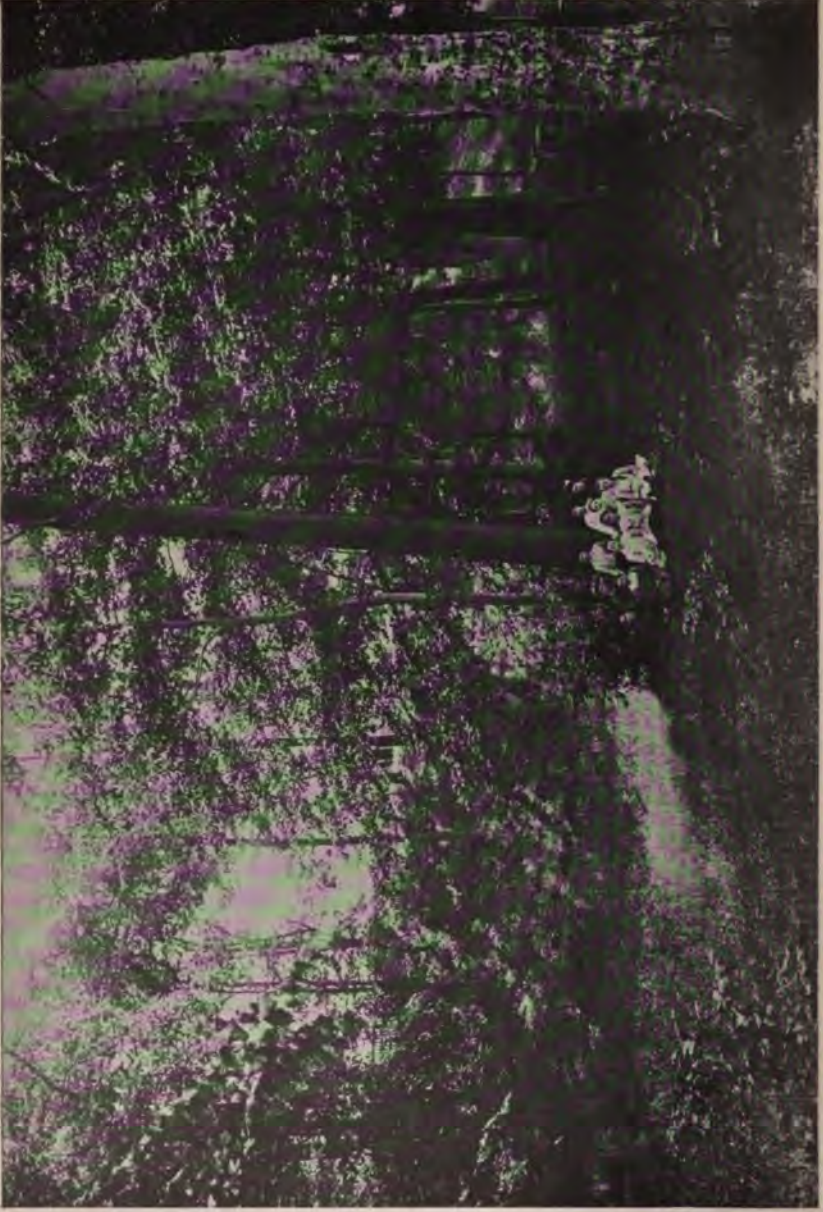
Date of election and length of service of members, 1865-1904.

CHESTER W. KINGSLEY	1865-1894
JOHN SARGENT	1865-1871
A. K. P. WELCH	1865-1871
ROBERT DOUGLASS	1865-1871
SAMUEL SLOCOMB	1865-1876
Z. L. RAYMOND	1871
HENRY L. EUSTIS	1871-1885
J. WARREN MERRILL	1871-1881
GEORGE P. CARTER	1871-1883
JOHN H. LEIGHTON	1876-1879
KNOWLTON S. CHAFFEE	1879-1889
JAMES M. W. HALL	1881-1899
LEANDER M. HANNUM	{ 1883-1884 1885-1893
JOHN F. O'BRIEN	1884-1895
GEORGE H. HOWARD	1889- (Now
E. BURT PHILLIPS	1893-1896
FRANK A. ALLEN	1895-1899
STILLMAN F. KELLEY	1894-1903
WELLINGTON FILLMORE	1896-1903
EDMUND H. STEVENS	1899- (Now
WILLIAM B. DURANT	1899- (Now
ANDREW J. RADY	1903- (Now
JOHN F. O'BRIEN	1903- (Now

Presidents of the Board

J. WARREN MERRILL	1865-1867
ERZA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-





Scene in Fresh Pond Park, Called "Truly-Rural"



Scene in Fresh Pond Park, called "Tasty-Moral"

REPORT OF THE CAMBRIDGE WATER BOARD

CAMBRIDGE, December 15, 1904

to the Honorable the City Council of the City of Cambridge

The forty-sixth annual report of the Cambridge Water Board for the year ending November 30, 1904, is herewith submitted for your consideration.

The different reservoirs, and other works under the charge of the Board are substantially in the same condition that they were a year ago, save that a striking improvement has been made in the grounds about Fresh Pond, which will be considered separately in another part of this report.

The main supply pipe is still inadequate to supply the needs of the population, in spite of all the efforts of the Board, nothing has been done save the construction of a new pipe line, the City Council having failed to make the necessary appropriation.

The quality of the water supplied by Hobb Brook and Stony Brook Reservoirs is still of good quality, and the supply abundant in the summer, but scanty at Fresh Pond, owing to the insufficiency of the main main pipe.

Actions for land damages have been settled except one, but there must be some further takings of land made at an early date, to protect under the water of Hobb Brook, at certain places which are possibly in a state of danger. The probable expense of such takings will however not be great, and, if they are made during the coming year, are unlikely to be any longer to the purity of the water.

FINANCIAL STATEMENT IN BRIEF

Amount paid for the Water Works to November 30, 1904, was	\$2,764,427 19
and was expended during the year on Construction Account	21,871 26
making the total cost to November 30, 1904, was	\$2,786,298 45

WATER BOND ACCOUNT.

The whole amount of bonds outstanding is	\$3,350,000 00
Deducting from this sum the present value of the Water Debt Sinking Fund, exclusive of the note of the City for \$200,000 . .	1,218,686 74
Leaves as the net Water Debt	<u>\$2,131,913 26</u>
For further details of the financial condition of the department, reference may be made to the statement of the Registrar appended to this report. From that statement it appears that the excess of expenditures over receipts during the past year is the sum of	<u>\$3,882 88</u>
The net Water Debt November 30, 1903, was	\$2,267,778 54
" " " " " " 1904, "	<u>2,131,913 26</u>
Reduction of net debt during the year	\$155,865 28

The deficit of \$3,882.88 was caused by payment into the Sinking Fund of a larger amount than the ordinances require. Strict compliance with the ordinances would have given us a surplus of nearly \$5,000, instead of a deficit of \$3,882.88, as stated above.

The reduction of the net debt during the year exceeds the reduction during the year 1903 by the sum of \$679.80, although there was no expenditure during that year for the improvement of Fresh Pond, while in the year 1904 there has been expended for that purpose the sum of \$12,500, so that the net increase in reduction of the debt may be properly called \$13,179.80.

WATER BASINS.

Hobbs Brook and Stony Brook Reservoirs are both nearly full, in spite of the dryness of the season, which has caused a scarcity of water in many cities and towns in New England. Fresh Pond, owing to the purchase of water during the year from the Metropolitan Water and Sewerage Board, (which is now in use), is rapidly rising, and will probably soon be filled, or nearly filled, so that no scarcity of water need be apprehended during the Winter.

In April last it became apparent that something must be done to avert a water famine, and, no other means of increasing the supply being possible, the Board requested the Metropolitan Board to provide the City with a temporary supply of water. This request was granted, and between April 27th and June 4th, 330,000,000 gallons of water were purchased at a cost of \$15,218. In November, last, the Pond being nearly five feet below high water mark, the Board recommended that a further supply be purchased, and the Metropolitan Board again consented to come to the relief of the City, so that at this date, the water-takers are entirely





Bridge to Gate House Over Waste-way at Stony Brook Reservoir



sewers with water delivered directly into the street mains through a connection made at the end of the main line. No water is available is pumped out from the Pump and is collected from Paved Pipes, so that in the water is not collected through the Street Pipes, many pipes are connected to the main line of fresh water.

7. That the present supply of purchased water will be about \$1,000,000 a year, the expenditure during the present year for the Metropolitan water of over \$4,000,000. In this connection, it should be pointed out that the City Council, that there is no reason to increase the rate on domestic water supply from this source and that there is no certainty that the Metropolitan Water Board will be able to supply water to the City. In the second place, it is to be seen, the fact, whether the Metropolitan Board will be the provider of water contained in Chapter 188 of the Acts of the Legislature of the year 1895, and the provisions thereto, relative to the water to any city or town within ten miles of the South River, and in the Metropolitan District, merely for the purpose of supplying the supply for the City of New York, some other city or town. The Metropolitan Board have generally been to the effect that it is to be done, but it has been made to be understood that it is not a new regulation which may or may not be done, they are to supply water to the City of New York.

NEW YORK 1117 1157

[illegible]

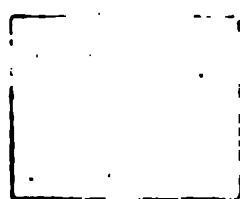
In the report of the Board for 1896 it was stated that by the year 1900 a new pipe would have to be laid, and such new pipe was advocated by the Board of the years 1898, 1899, 1900, 1902 and 1903.

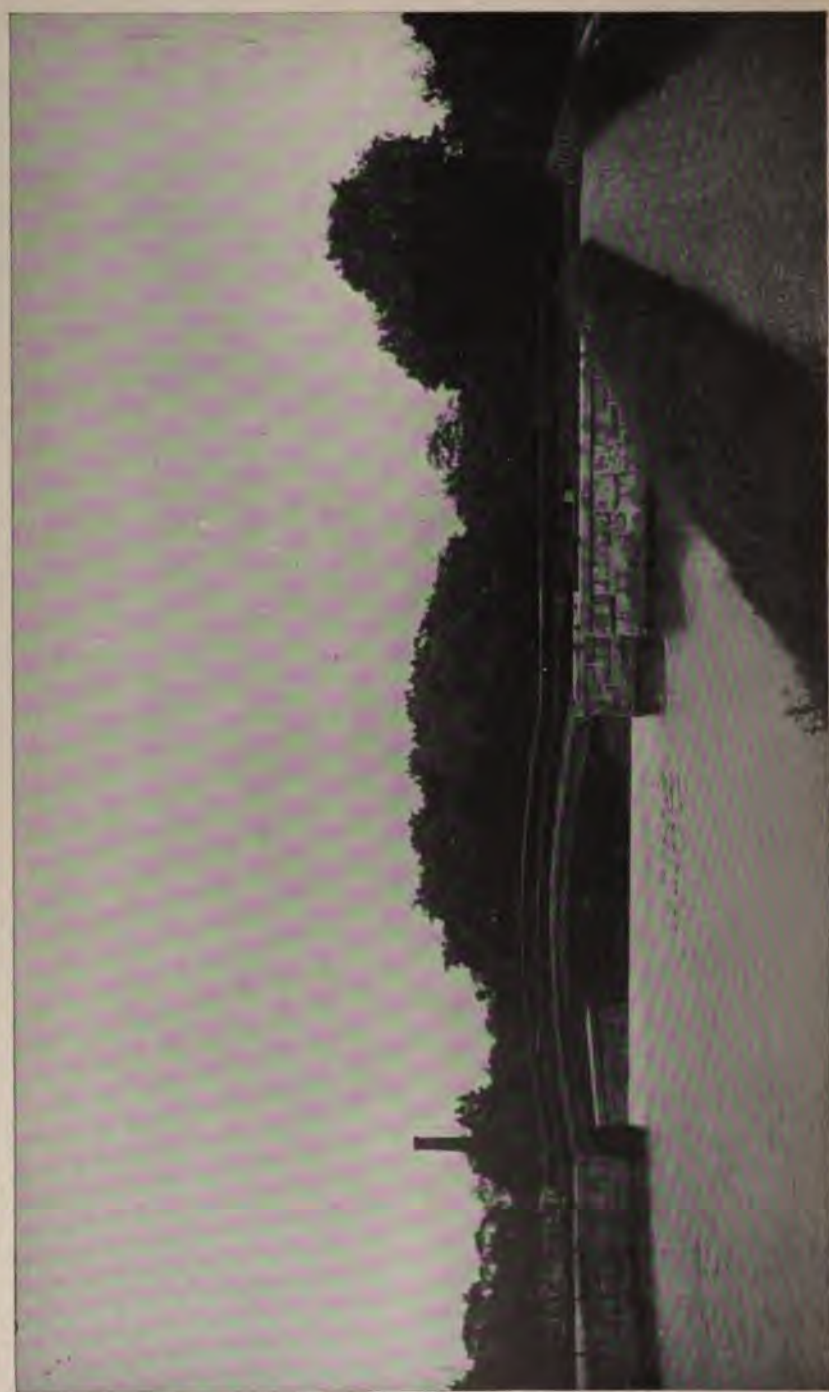
The City Council of the year 1903 voted that the Mayor petition the Legislature for permission to issue bonds to the amount of \$500,000 for the purpose of constructing a new pipe line, and such petition was drawn up, signed by the Mayor, and presented to the Legislature early in the session of 1904. After due hearing before the Legislative Committee, to whom the petition was referred, the committee reported recommending that the petition be granted, and an Act authorizing the issue of bonds was passed February 16, 1904. See Chapter 90 of the Acts of the year 1904.

Very soon thereafter the Water Board requested the City Council to make an appropriation of \$500,000 for the purpose of beginning the construction of a new pipe line in three sections, one section from Hobbs Brook Reservoir to a point on the present pipe line passing through Newton Street in Waltham, another from Irving Street in Watertown to Fresh Pond, and another section from Irving Street to meet the section first named. This request was denied. The Committee on Water Supply subsequently recommended an appropriation of \$250,000 with which to construct the lower section from Irving Street to Fresh Pond; but although the entire Board of Aldermen voted in favor of the appropriation, with a majority of the Common Council concurring, the appropriation failed, because two-thirds of the Common Council did not concur with the Board of Aldermen, a two-thirds vote being necessary.

The lower section was to be constructed entirely of concrete, sixty-three inches in diameter, and, inasmuch as the summits above the hydraulic mean gradient, which greatly obstruct the flow of water in the present pipe, are all between Irving Street and Fresh Pond, this new section alone would have so increased the capacity of the pipe that it would have delivered water enough to meet all demands for at least four years to come.

The annual interest and sinking fund payments on the cost of this section would be \$13,750. As it is, the City has paid, including the cost of the water now being supplied, over \$30,000 for water from the Metropolitan Board, while it could have had water from our own sources at an expense of \$13,750. It is plainly evident, that the new pipe line





Waste-way and Dam at Stony Brook Reservoir

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Waste-way and Dam at Stony Brook Reservoir

The decrease is undoubtedly due to the smaller rain-fall this year, which is several inches less than the rain-fall of the year 1903, as appears by the following table.

The annual rain-fall for the past ten years at Fresh Pond is as follows :—

	Inches.
1895	47.12
1896	38.82
1897	42.53
1898	52.42
1899	37.28
1900	46.89
1901	46.20
1902	43.31
1903	44.23
1904	42.89
Average	44.17

The rain-fall for the year at Hobbs Brook was 39.95 inches ; at Stony Brook, 41.18 inches.

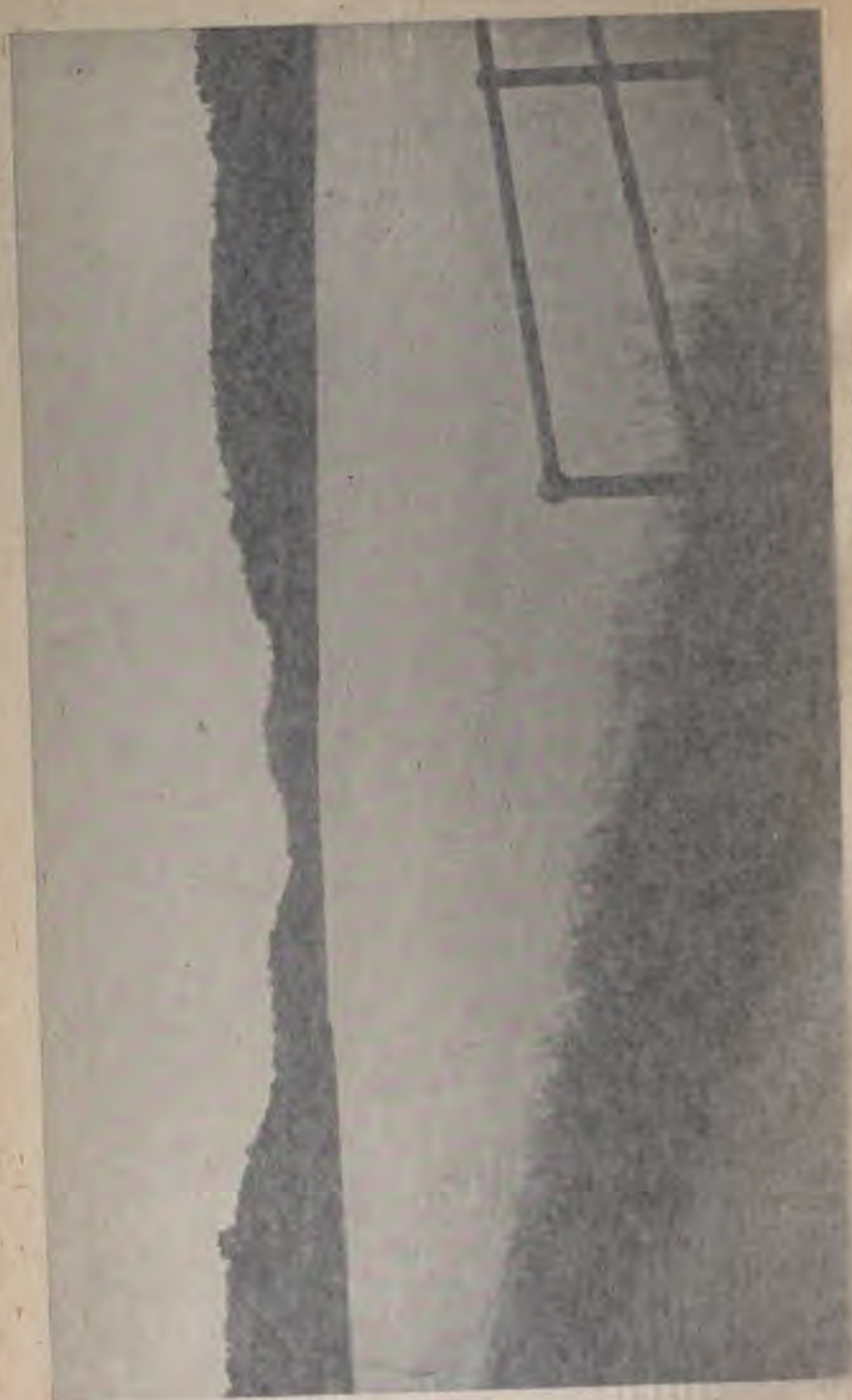
The rain-fall for the year at Hobbs Brook was 39.95 inches, as compared with 47.42 inches in 1903, showing a loss of 7.47 inches. The rain-fall at Stony Brook was 41.18 inches, as compared with 45.97 inches in 1903, a loss of 4.79 inches.

The prediction of the Board, in the last annual report, that the year 1904 was likely to be a dry year has been fulfilled.

CONSUMPTION OF WATER.

The total consumption of water for the year ending December 1, 1904, was	3,210,982,145 gallons
For the year ending December 1, 1903	3,160,704,545 "
Excess of consumption this year	50,277,600 gallons
The excess of consumption for the year ending December 1, 1903, over the year ending December 1, 1902, was	230,150,815 "
In 1894 the total consumption was	2,127,878,627 gallons
The consumption of the year 1904 being	3,210,982,145 "
and that of 1894	2,127,878,627 "
In ten years the consumption has increased	1,083,103,518 gallons
or about one-half.	

The reduction in excess of consumption this year is undoubtedly due in part to the introduction of additional meters.



View of River, Lake, and Bridge, Northwest

ELECTROLYSIS

The action of the electric current liberated in the ground by the operation of the Boston Elevated Railway Company's main pipes, has caused rapid deterioration, resulting in many instances in complete perforation of the pipe, thereby causing leaks which appeared at the surface of the ground.

The fourth-inch steel main in Huron Avenue, has been exposed for a long distance and repairs have been made as well as possible; the holes being closed with plugs, secured by straps, and while the pipe was exposed the straps were taken and repairs may be found with this report. For more detailed statement the Board refer to the report of the Electrical Engineer employed to consult with and advise the Board, as to the cost of the Superintendent, both printed herewith. Some sections of cast-iron pipe, used in the iron and steel pipes in the ground are to be removed and destroyed. The proposed new main pipe from Fresh Pond to Irving Street, and the next section to Newton Street, Waltham Avenue, which are to be made principally of iron pipe, will not be subject to electrolysis. This is another argument in favor of the use of iron pipe, and is superior to iron, and will also be free from rust and deterioration.

METERS

The Board have caused to be set out the year 1911 meters, all upon condition of water-takers who prefer to pay for water, to be set out to be set out in all over 2,000 meters. Several years ago the Board agreed to install a complete meter system, and a considerable amount was made by the City Council for that purpose. Many were accordingly purchased and set out. Subsequently, the City Council turned its power and was appropriated money for the setting out of meters where the water-takers who had no apparatus for the same.

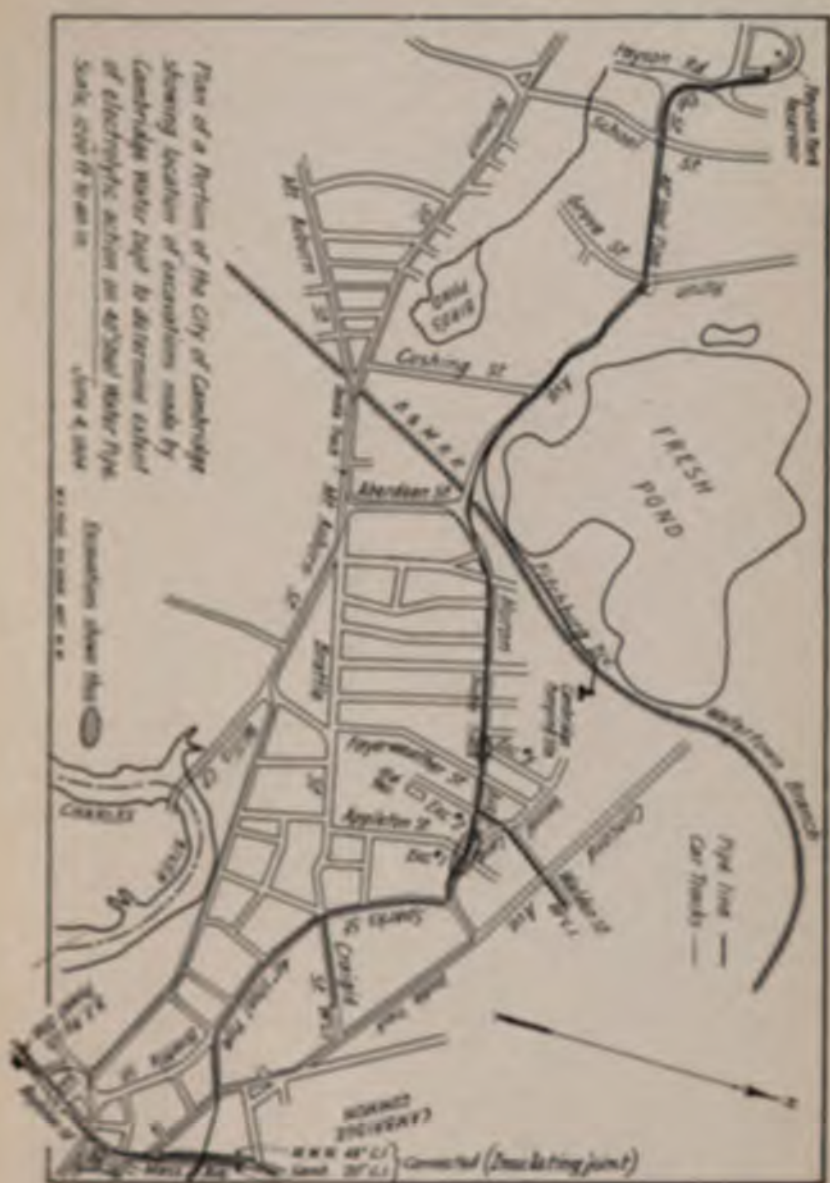
At the last fact among water-takers who are supposed to have entered without their consent, to use the water, and to pay for it or they use, where in other portions of the City where no pipes are used, consumers can use the waste water as much as they desire. Other hand other water-takers who have no meters are not stated they are obliged to pay for water at a fixed rate and these are sometimes put in the Board to have meters attached to their

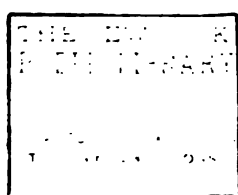
supply pipes. Often there are pending many applications for meters which the Board is unable to grant for lack of sufficient appropriations. Such a state of things is far from satisfactory, and the Board recommends the City Council to give the matter careful consideration, and advise that the meter system be gradually extended, by granting meters to all that apply for them, even if the City Council should not be disposed to require that all consumers shall be supplied through meters. The Board believe that even with the small number of meters already set, a considerable reduction has taken place in the amount of water wasted, and that it would at all events be well for the City Council to consider once more the policy of gradually applying the meter system to all supplies.

Respectfully submitted,

WILLIAM B. DURANT,
GEORGE H. HOWARD,
EDMUND H. STEVENS,
ANDREW J. RADY,
JOHN F. O'BRIEN,

Cambridge Water Board.





REPORT OF ELECTRICAL ENGINEER

CAMBRIDGE, December 17, 1904

Presented to the Water Board

SIR:—In reply to your request for a statement of the electrical action on the Cambridge water pipes, I would respectfully submit the following report:

There is a large amount of damage being done to the pipes of your commission by the current of the Boston Elevated Railway Company. That you may the better understand the difficulty a description of the distribution of power is necessary.

The Elevated Railway Company has a power house on Boylston Street, near Harvard Square, from which several thousand horse power of electrical energy is distributed. There are here located large engines and a dynamo capable of developing current at a pressure of five hundred volts. This current is sent out to all parts of Cambridge and surrounding territory by underground wires which are connected to numerous overhead wires, leaving the conduits. These wires, called feeders, are in turn connected to the trolley wires in and about Cambridge. The current flows through the motors of the cars, where its potential energy is largely consumed. The current flows to the rails and then back over the rails and under ground connections to the power house. The rails are connected together by fish plates, which carry some of the current. The cars are connected to the rails around the fish plates, and in some cases the cars are pulled together by a mass of cast iron wheels, which come in contact with the rails and make an easy path for the "leak" current. There are also large copper wires connected to the rails, which carry the system which are called cat wires, or the light trolley wires, and are used

to reduce the resistance to the "leak" current, which is still a very high figure, though the return rail and wire system is a very small fraction of what is now carried on the water pipes. The "leak" is now to the extent

path. The Boston Elevated Railway Company has *not* put in return wires as rapidly as they have increased the current flowing out to propel their cars.

The result of this negligence is increased action on the City pipes. It is a well recognized fact that all the current sent out must return to the dynamo; and it is also a well known electrical law that the path which this current will take will be a divided one, a part going by each path available, the relative amounts being inversely proportional to the resistance offered by the paths. The larger part will return by the rails and return wires and the lead covering of the cables, a lesser amount by the ground and pipes.

In those parts of the City where the current goes into the pipe there will be no action which injures them; but all current that flows from distant points back towards the power house must leave the pipes and go to the rails again. I find from a survey that for over a mile in all directions from the power house this condition of affairs, *i. e.*, a flow of electricity from pipes to rail, and in this entire section there is electrolytic action night and day in proportion to the number of cars running.

In Putnam Square where water pipes pass under the conduits some current leaves the pipes and takes to the lead sheaths of the cable.

I have known of sections of pipes or connections losing sixty per cent. of their weight from this cause in six months.

Recently the six-inch main on Boylston Street has developed holes from this cause.

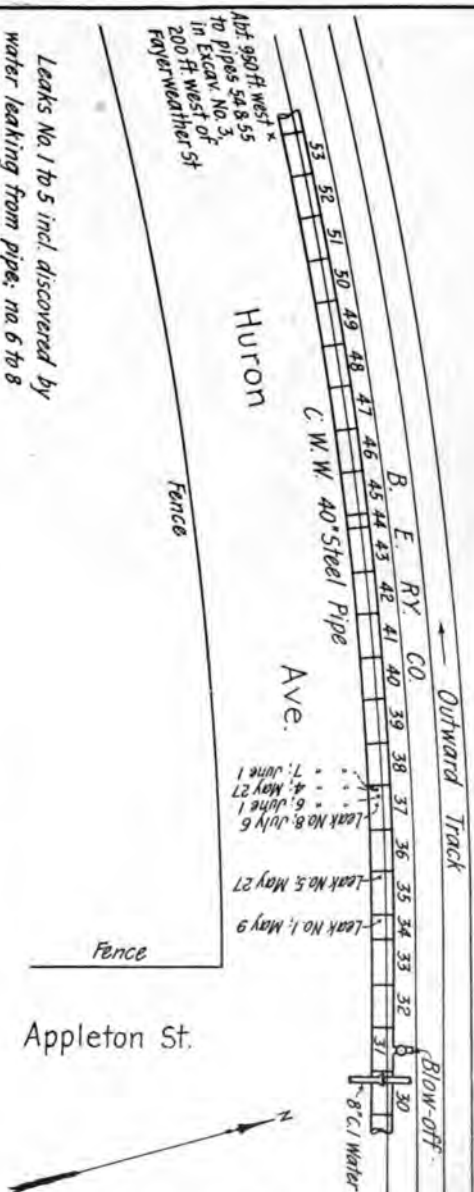
The most serious trouble, however, this year, has been on Huron Avenue, near Sparks Street, where numerous holes described in your Superintendent's report have developed in the forty-inch steel main. This difficulty was discovered early in the Summer and I was enabled to conduct a series of experiments and make some careful measurements to which I referred in a communication sent to you in June, just before I sailed for Europe. This work was, however, nearly completed and I have had the benefit of the further work of Mr. Corning, an electrical engineer, connected with the Boston Elevated Railway Company, and of Mr. W. E. Foss of the Metropolitan Water Board, who concluded the experiments in July.

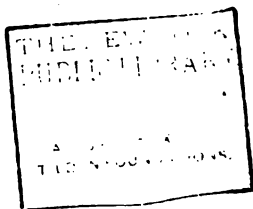
Before I went Mr. Corning and I agreed that a connection could be

Leaks No. 1 to 5 incl. discovered by water leaking from pipe: no. 6 to 8 developed during examination of pipe.

Plan of C.W.W. 40" Steel Pipe Line
Huron Ave., Cambridge at Excavation No. 2
to determine extent of electrolytic action.

Scale, 1 in. = 20 ft. June 16, 1904.





side between the main and the rail at Huron Avenue and Sparks Street is a benefit. During the summer this connection was established and the action largely reduced at this point. You should however understand that such a connection is not an unmixed blessing, for when rail and pipe are connected you have reduced the resistance and increased the amount of current flowing on the pipes, and in the event of the joints in the pipes being poor electrical connection there is likely to be action on the pipes near the current leaves to flow through the ground to reach the other side of the joint.

On the forty-inch steel main I found the riveted joints of low resistance even the joints riveted in the trench, called "field joints" were of very low resistance, equalling less than a foot of plain pipe. This main was not connected with the other pipes at many points and could be more easily handled than any other part of your system. It is a vital part of the water and should be preserved even at the sacrifice of connecting branches. It therefore seemed wise to place an insulating joint in each of these branches where it joins the forty-inch main. One was placed on the branch at Cushing Street and one at Reservoir Street and an immediate fall in the flow of current was noticed. We shall expect more action at the ends of each of these branches near Huron Avenue than we have had heretofore, but the damage to the City will be less than would be the case had we not installed these joints.

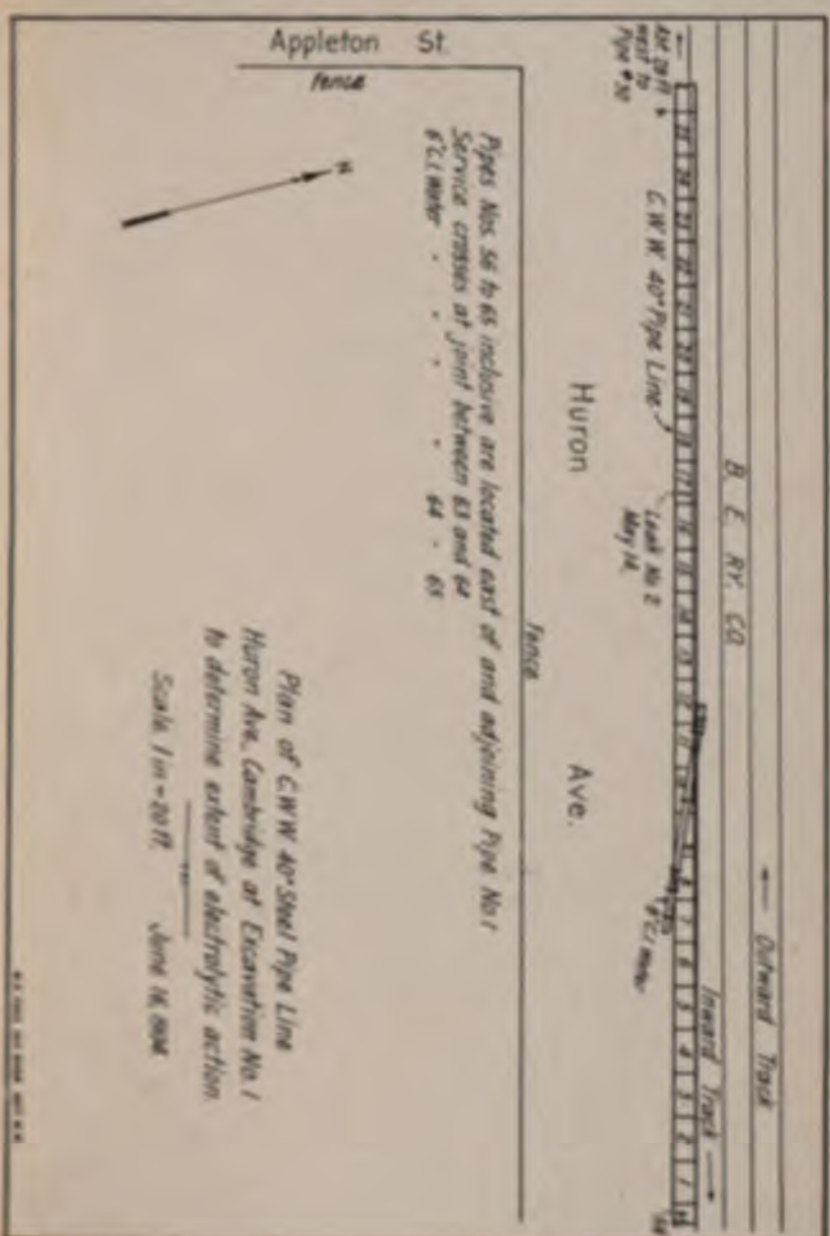
It is my opinion your Board has done all that it can do to protect the City. I am however of the opinion that the Boston Elevated Railway Company has been negligent in that it has not supplied sufficient return wires for its system. More of such wires would lessen the action on the system and a double trolley wire would completely eliminate the trouble.

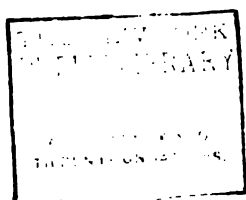
Respectfully yours,

Signed:

CHAS. H. MORSE,

325 Harvard Street, Cambridge, Mass.





Electrolytic Investigation on 40-in. Steel Pipe

HURON AVENUE. CAMBRIDGE

May and June. 1904

INDEX

Electrolytic Investigation on 40-inch Steel Pipe, Huron Ave., Cambridge.

TABLE.

NATURE OF TEST.

1. Measurement of resistance of 40-inch Steel Pipe at Cambridge Pipe Yard. May 26, 1904.
2. Comparison of joints in pipe at Excavation east of Appleton St. May 27, 1904.
3. Drop over 46½ feet of 40-inch pipe at Appleton St. Excavation and 50 feet at R. R. Bridge. May 28, 1904.
4. Drop over 92.8 feet of pipe east of Appleton St., with arrangements for Bonding. May 31, 1904.
5. Potential between pipe and rail. Pipe normal also bonded to rail. June 1, 1904.
6. Drop on branch pipes at Reservoir St., Park Ave. and Cushing St. June 1 and 2, 1904.
7. Potential between pipe and rail at Garden, Appleton and Fayerweather Sts., and R. R. Bridge. June 6, 1904.
8. Potential between pipe and rail at Garden, Appleton and Fayerweather Sts., and R. R. Bridge. Bond at Washington Elm. June 6, 1904.
9. Same as 7. June 6, 1904.
10. Same as 8. June 6, 1904.
11. Drop on pipes at Garden, Appleton and Cushing Sts., and Park Ave. Conditions, normal. June 6, 1904.
12. Same as 11, except Bonded at Washington Elm. June 6, 1904.
13. Drop on pipes at Appleton, Reservoir and Cushing Sts., and Park Ave. Normal conditions. June 6, 1904.
14. Same as 13, except Bonded at Appleton St. June 6, 1904.
15. Drop on 40-inch pipe at Cambridge Common. Pipe normal and Bonded at Washington Elm and Appleton St. June 8, 1904.
16. Comparison between drop over one section of 40-inch Steel Pipe 6.9 feet long and a length including 14 sections and 14 joints 92.8 feet long. June 9, 1904.

Table No. 5 showed that with a bond between pipe and rail of proper size and length at Appleton Street action at this point would be greatly reduced.

Table No. 6 tends to show that all the current on the 40-inch main at Appleton Street does not come from the branches at Reservoir Street, Park Avenue, and Cushing Street, but is from other sources.

Tables No. 7 and No. 8 tend to show that with bond at Garden Street, at Washington Elm, action would not be stopped at Appleton Street.

Table No. 15 shows that a bond at the Washington Elm brought a large flow of current off of the Massachusetts Avenue lines, with no assurance of a corresponding decrease at the power house. That under normal condition, *i. e.*, without bond, that a large current was flowing on to the Massachusetts Avenue pipes which would have to leave them again at the power house and cause trouble there. It also shows that a bond at Appleton Street would probably relieve both of these conditions.

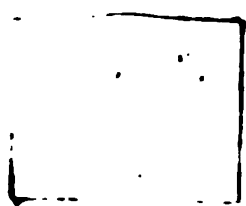
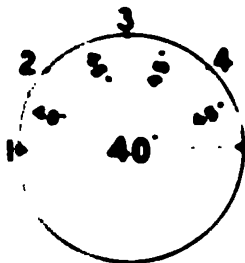


TABLE I
ELECTROLYTIC INVESTIGATION ON 40 INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE

May 26, 1904

Measurement of resistance of 40 inch Steel Pipe at Cambridge Pipe Yard



Ammeter No. 407.

M. V. No. 14419

Length of pipe, 5 feet, 7 inches

1			1		
Ampere	M. V. Volts	Resistance per ft.	Ampere	M. V. Volts	Resistance per ft.
7.5	65		125.5	90	
11.5	66		125.0	90	
17.5	66		125.5	90	
20.5	67		125.5	90	
Average	65	0.000125	125.5	90	0.000125
2			2		
Ampere	M. V. Volts	Resistance per ft.	Ampere	M. V. Volts	Resistance per ft.
10.5	61		125.5	90	
15.5	61		125.5	90	
17.5	61		125.5	91	
20.5	61		125.5	90	
Average	61	0.000116	125.5	90	0.000125
3			3		
Ampere	M. V. Volts	Resistance per ft.	Ampere	M. V. Volts	Resistance per ft.
10.5	61		125.5	90	
15.5	60		125.5	90	
17.5	60		125.5	90	
20.5	61		125.5	91	
Average	61	0.000119	125.5	91	0.000125
4			4		
Ampere	M. V. Volts	Resistance per ft.	Ampere	M. V. Volts	Resistance per ft.
10.5	61		125.5	90	
15.5	60		125.5	90	
17.5	61		125.5	91	
20.5	61		125.5	91	
Average	61	0.000119	125.5	90	0.000125
Average Resistance per ft. 0.000125			Measurement taken on 1/2 inch of 40 inch pipe including above		
Average per M. V. per ft. 65			10.5	60	
			15.5	60	
			17.5	61	
			20.5	61	
			Average	61	0.000125

Same resistance resistance of pipe with joints to pipe without joints 1.25

TABLE 2.

ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

May 27, 1904.

Comparison of joints in pipe at excavation east of Appleton Street
Readings taken over 7.05 feet of pipe including a joint.

Simultaneous readings over alternate joints.

First section $6\frac{1}{2}$ feet east of a line opposite pole $5\frac{1}{2}$.

M. V. M. No. 6789 and M. V. M. No. 14449.

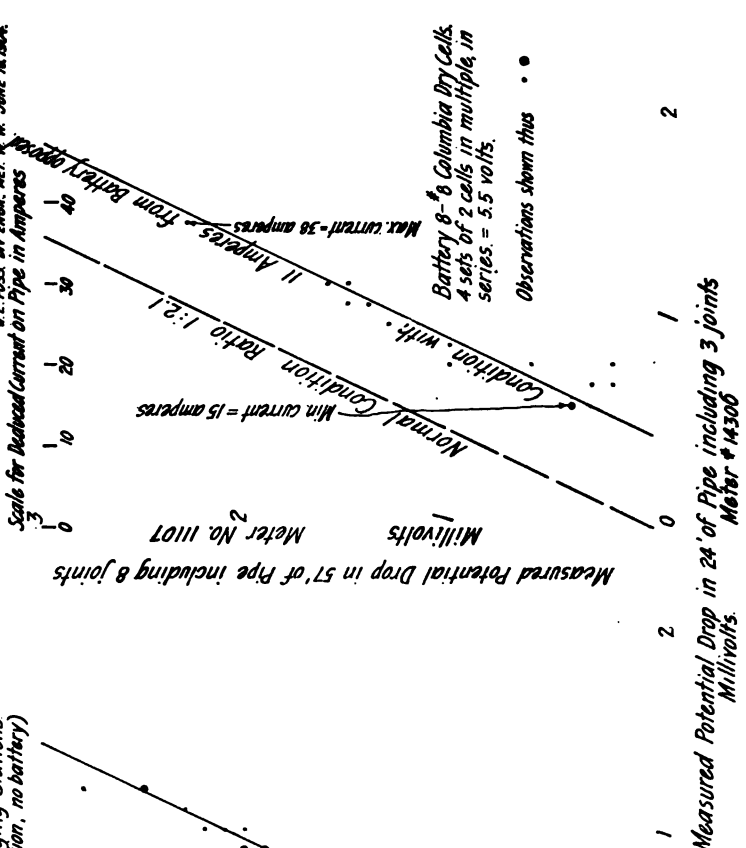
Readings in divisions. 1 division = .2 M. V.

Joint 3	Joint 1	Joint 16	Joint 14
1.3	1.3	Transposed Meters.	
1.3	1.4	1.80	1.60
Joint 4	Joint 2	1.15	1.00
1.1	1.5	1.10	1.10
.9	1.1	1.50	1.50
.9	1.1	Joint 17	Joint 15
1.0	1.3	1.20	1.00
Joint 7	Joint 5	1.75	1.40
1.5	1.95	1.20	1.20
1.6	1.60	1.10	1.10
1.7	1.80	Doubtful.	
1.1	1.10	Joint 20	Joint 18 Field joint
Joint 8	Joint 6	1.20	1.10
1.3	1.75	1.00	.80
1.2	1.70	.90	.70
1.9	2.20	1.50	1.30
1.6	2.10	Joint 21	Joint 19
Joint 11	Joint 9	1.20	1.30
1.6	2.0	2.20	2.20
1.6	1.9	2.20	2.20
2.0	2.0	Joint 24	Joint 22
1.6	1.6	2.0	1.80
2.1	2.0	1.3	1.50
Joint 12	Joint 10	1.2	1.10
2.10	2.25	1.8	1.40
2.10	2.30	Comparison of two sections of 7 joints each	
2.20	2.40	Meters with long leads checked.	
Joint 15	Joint 13	Includes { 6.0 7.0	
1.30	1.80	2 field joints. { 9.5 10.0	Includes
1.60	1.90	{ 5.4 6.0	1 field joint
1.50	1.70	{ 8.6 9.0	
2.00	2.00	Moved along one pipe length.	
Transposed Meters.		7.0	7.0
2.05	2.00	12.4	12.0
1.85	1.40	8.8	8.5
1.30	1.10	9.4	10.0
		East of Appleton St. West of Appleton St	
		11.3	12.0
		13.0	13.0
		14.0	14.0
		8.8	9.0
		12.0	12.0

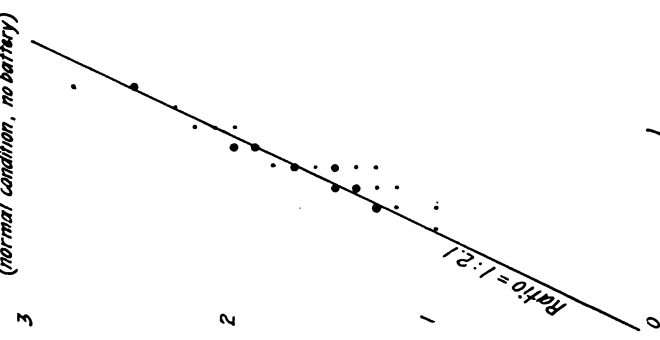
*These readings supposed not good on account of bad contact.

2011

Battery test to determine amount of electricity flowing on C.W.N. 40 Steel Pipe, Huron Ave. Cambridge, Mass. May 2, 1904.
W.E. Foss, W.E. Engle, Met. W. W. June 14, 1904.



Ratio of Gauging Stations
(normal condition, no battery)



See N.B. 1140-45

TABLE 4.
ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

May 31, 1904.

Readings of drop taken over 92.8 feet of pipe in excavation east of Appleton Street. Arrangements for connections between track and pipe at the following locations: 120 feet east of Appleton Street, called "East Bond;" 10 feet west of Appleton Street, called "Middle Bond;" and a few feet west of Fayerweather Street, called "West Bond."

M. V. M. No. 14449. Current flowing east = + readings.

Normal Conditions.		East Bond Connected.		West Bond Connected.		Middle Bond Connected.	East & Middle Bonds Connected.		East & West Bonds Connected.		East, Middle & West Bonds Connected.		Middle & West Bonds Connected.	
2.47 P.M.	2.23 P.M.	2.49 P.M.	4.00 P.M.	3.20 P.M.	3.24 P.M.	2.53 P.M.	2.51 P.M.	3.40 P.M.	3.26 P.M.	3.57 P.M.	3.57 P.M.	3.55 P.M.	3.43 P.M.	
M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	M.V.	
2.20	1.80	4.00	6.00	1.80	2.00	-1.20	3.00	5.20	6.00	5.00	6.80	9.20	-1.80	
2.20	1.80	4.00	6.00	1.80	1.60	-1.60	2.20	4.40	7.20	6.20	8.40	5.10	-2.40	
2.20	1.60	3.85	5.40	2.00	.0	-1.60	3.00	4.00	6.60	10.00	6.20	6.00	-1.20	
3.00	.80	4.20	5.60	2.40	3.00	-1.00	1.80	4.20	7.80	11.00	7.40	8.00	.40	
2.30	1.60	4.40	4.20	.80	2.60	1.20	.60	4.20	6.60	11.00	7.60	10.00	-2.00	
3.20	2.00	3.90	4.40	4.00	2.40	-1.30	1.80	4.80	5.00	9.00	6.40	8.00	-.60	
2.60	2.00	3.40	5.20	5.00	2.00	-.60	3.00	3.30	5.00	6.00	6.20	6.40	-1.00	
2.40	3.00	4.70	6.00	2.40	2.00	-1.30	2.80	2.80	7.80	7.20	6.50	7.00	-2.00	
1.80	1.80	4.30	5.80	-.40	-.40	.0	2.60	3.00	9.00	4.60	7.00	6.20	-2.00	
1.70	1.60	4.60	5.40	.20	-.80	-1.00	3.40	2.80	7.80	6.40	4.60	6.00	-1.20	
2.00	2.20	4.40	5.60	1.40	2.00	-.40	3.80	4.00	6.80	8.80	6.20	5.80	.20	
1.60	3.00	5.10	5.00	.40	2.40	-1.00	3.80	4.40	8.80	6.40	9.60	5.60	.0	
2.90	3.10	4.20	5.40	4.00	3.00	-2.40	4.60	4.40	6.60	8.40	6.80	4.20	-.20	
2.40	2.60	3.80	4.80	1.20	2.60	-1.90	3.00	4.60	5.10	9.20	7.40	8.20	-2.00	
2.40	3.00	1.40	4.60	.20	1.80	-1.80	2.10	4.00	3.80	9.40	6.00	10.40	.80	
3.20	1.80	4.00	5.00	1.80	.80	-1.20	3.80	3.80	4.90	10.20	6.50	6.60	-2.00	
4.00	2.70	4.40	5.20	1.80	1.10	-1.60	4.00	2.40	5.00	9.40	6.20	6.60	-1.00	
3.80	2.40	4.20	4.20	.50	.70	-2.00	3.00	4.00	4.40	8.00	9.00	5.80	-1.20	
2.30	2.00	4.60	4.40	2.20	3.30	2.00	4.20	4.60	5.40	9.20	7.00	7.00	-.80	
2.40	2.60	4.80	6.00	.80	2.00	.80	1.40	4.00	6.00	7.20	7.40	7.20	-.50	
2.60	2.60	4.60	6.20	3.60	2.80	-.60	4.40	4.40	6.70	6.00	7.20	5.00	.0	
2.80	3.60	4.20	5.80	1.20	2.60	.0	3.80	4.00	4.60	11.00	5.80	6.00	.80	
3.10	3.20	4.60	....	1.60	....	.0	3.00	....	7.60	....	8.00	....	....
1.80	....	5.10	....	1.00	....	-1.00	3.20	....	8.00	....	....	....	....
....	....	....	....	2.00	....	....	....	....	....	....	....	....	....
Ave.	2.54	2.27	4.33	5.27	1.75	1.79	-.81	3.01	3.97	6.35	8.16	7.01	6.83	-9.4
2.41		4.80		1.77		3.49		7.26		6.92				
Approx. Amps. 21.0		41.7		15.4		-7.0		80.2		63.2		60.2		-6.3
1.17		1.17		1.17		1.17		1.17		1.17		1.17		1.17
17.9 Amps.		35.6 Amps.		13.1 Amps.		-6.0 Amps.		25.8 Amps.		54.0 Amps.		31.5 Amps.		-7.0 Amps.

1]

Battery test to determine amount of electricity flowing on C.W.W. 40" Steel Pipe, Huron Ave. Cambridge Mass. May 31, 1904.

W.E. POSS, DIV ENGR, MET. W. W. JUNE 16, 1904

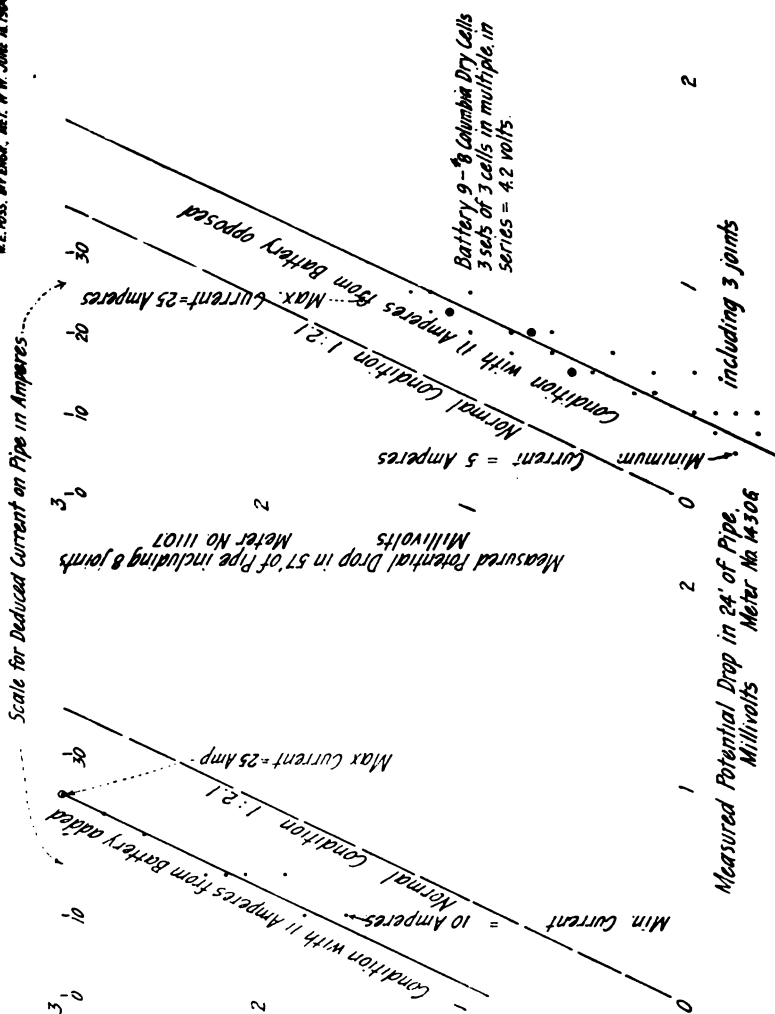


TABLE 6.

**ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.**

Drop on branch pipes at Reservoir Street, Park Avenue and Cushing Street.

In each case current flows towards 40-inch steel main.

		RESERVOIR ST.		PARK AVE.		CUSHING ST.			
Drop over 92.8 feet of 40-inch steel main near Appleton St. M. V. M. No. 14449. June 1, 1904.		Drop over 9.8 feet of 20-inch cast iron pipe. M. V. M. No. 6789. June 1, 1904.		Drop over 5 feet, 9 inches of 8-inch cast iron pipe. M. V. M. No. 14449. June 2, 1904.		Drop over 5 feet, 10 inches of 12-inch cast iron pipe. M. V. M. No. 6789. June 3, 1904.			
Normal Condition	With bond at Appleton Street.	Normal Condition.	With bond at Appleton Street.	Normal Condition.	With bond at Appleton Street.	Normal Condition.	With bond at Appleton Street.		
3.0	5.6	.6	.8	1.50 1.60	2.40 2.30	.30	.30	.10	.45
3.4	5.8	.9	.7	1.40 1.95	2.70 2.60	.30	.40	.10	.45
2.6	5.2	.7	.8	1.55 1.50	2.60 2.25	.25	.40	.20	.40
2.2	5.0	.6	1.0	1.70 1.20	2.60 2.80	.30	.35	.40	.35
2.6	5.2	.8	1.0	1.70 1.10	2.50 2.65	.30	.40	.45	.35
2.6	6.0	.9	.9	1.40 1.90	2.40 2.70	.35	.40	.35	.30
2.5	5.8	.7	.9	1.40 1.80	2.50 2.45	.30	.35	.10	.25
4.0	6.2	.8	.8	1.80 1.80	3.00 2.30	.25	.35	.30	.40
3.2	4.8	.7	.8	1.85 1.85	2.80 2.00	.25	.35	.40	.35
2.1	5.2	.6	.7	1.60 1.80	2.50 2.10	.20	.30	.40	.25
3.0	5.8	.5	.9	1.60 1.25	2.20 2.50	.25	.35	.45	.15
3.6	6.0	.6	1.0	1.10 1.40	2.50 2.40	.25	.35	.40	.30
4.0	4.8	.7	.8	1.25 1.95	3.70 2.35	.22	.40	.40	.35
4.0	5.0	.6	.8	1.60 2.00	3.00 1.90	.30	.45	.25	.40
3.2	5.0	.7	.7	1.40 1.85	3.00 1.80	.30	.45	.20	.35
3.4	4.2	.6	.8	1.35 1.95	2.60 2.15	.30	.40	.25	.40
2.8	4.6	.5	.6	1.50 1.70	2.70 2.20	.25	.40	.10	.35
3.0	4.6	.7	.8	1.60 2.00	2.05 2.30	.30	.40	.40	.30
3.6	4.8	.7	.8	1.10 1.90	1.95 2.30	.30	.40	.40	.35
3.6	4.2	.8	.9	1.10 1.10	2.00 2.45	.30	.40	.40	.35
2.8	4.8	1.0	.9	1.40 1.95	2.10 1.85	.30	.30	.40	.30
2.2	5.2	.8	.8	1.70 1.20	2.40 1.90	.15	.25	.45	.25
2.0	5.6	.7	.7	2.00 1.80	2.50 2.40	.25	.40	.50	.35
3.4	5.8	.7	.6	1.55 2.00	2.30 1.70	.25	.40	.45	.35
Ave.=2.98	6.6	.8	.8	1.80 2.40	2.30 1.90	.25	.30	.50	.35
	5.8	.6	.7	2.20 1.60	2.20 2.30	.20	.35	.40	.30
	5.4			2.90 1.60	2.90 1.60	.40	.35	.40	.30
22.1 Amps.		Ave.=	Ave.=.81	1.90 1.85	2.80 2.10	.25	.35	.45	.30
	Ave.=5.30	11.3	13.0	1.85 2.00	2.25 2.40	.30	.40	.45	.40
	39.2 Amps.	Amps.	Amps	1.40 1.60	2.40	.20	.45	.50	.35
				Ave.=1.683	Ave.=2.40	Ave=.311	Ave=.335		
				7.7 Amps.	11.0 Amps.	3.6 Amps.	3.35 Amps.		

1999年12月15日

Figure 1. The effect of the concentration of the polymer on the gelation time of the polymer solution.

會 豐 號 經 理 處

404-120-4344

2000

As reported in a recent issue of the *Journal of the American Medical Association*, the following information was obtained from a review of the records of the National Cancer Institute:

TABLE 8.
ELECTROLYTIC INVESTIGATION OF 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 6, 1904.

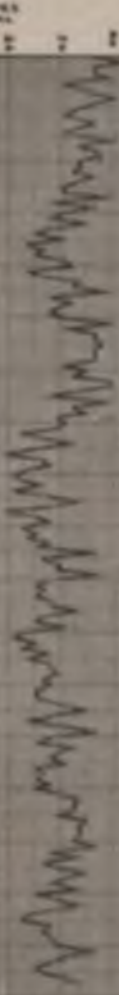
Readings taken from 2.10 to 2.15 p. m. of Potential Differences between Pipe and Rail at Garden, Appleton and Fayerweather Streets and Railroad Bridge.

Track bonded to Pipe at Washington Elm.

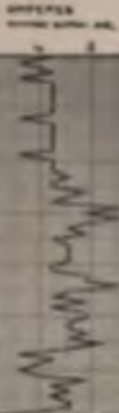
Garden Street at Washington Elm.	Huron Avenue at Appleton Street.	Huron Avenue at Fayerweather Street.	Huron Avenue at Railroad Bridge.
Pipe + V. M. No. 8072.	Pipe — V. M. No. 9631.	Pipe — V. M. No. 9725.	Pipe — V. M. No. 3931.
.11 Volts.	.75 Volts.	1.30 Volts.	1.95 Volts.
.11	.55	1.15	1.45
.12	.60	.80	1.10
.12	.50	.65	.95
.13	.45	.60	.90
.12	.50	.90	1.25
.10	.45	1.40	1.75
.12	.50	.65	1.60
.12	.08	.80	1.00
.14	.95	.90	1.10
.13	.50	1.15	1.45
.13	.40	1.30	1.50
.12	.70	.70	1.05
.13	.78	.45	.80
.11	.25	1.05	.95
.11	.30	.60	1.30
.13	.78	.95	1.15
.14	.25	.85	1.00
.13	.15	.70	1.00
.14	.75	.50	1.20
.11	.05	.95	.75
.12	.45	.80	.75
.13	.65	.95	.70
.12	.50	.75	1.05
.13	.68	.15	1.25
.14	.48	.50	.75
.14	.25	1.10	.80
.12	.25	.75	1.45
.12	.30	1.30	1.50
.13	.65	1.20	.90
Ave. .12*	.54	.86	1.15

* NOTE.—Low readings supposed to be caused by poor contact.

INSTRUMENT IN LABORATORY, RESULT OF PRACTICE
 OF PATENT FOR THE FIRST 11 YEARS, IN THE
 OF PATENT FOR THE FIRST 11 YEARS, IN THE
 OF PATENT FOR THE FIRST 11 YEARS, IN THE



The following table shows the results of the practice of the patent for the first 11 years, in the of patent for the first 11 years, in the of patent for the first 11 years, in the



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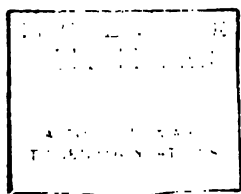


TABLE 9

ELD TROLYTO INVESTIGATION ON 40 INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 6, 1904

Readings taken from 220 to 225 p. m. of Potential Differences
between Pipe and Rail at Garden, Appleton and Fayerweather Streets
and Railroad Bridge

NORMAL CONDITIONS

Garden Street at Washington St.	Huron Avenue at Appleton Street	Huron Avenue at Fayerweather Street	Huron Avenue at Railroad Bridge
<p>1000</p> <p>900</p> <p>800</p> <p>700</p> <p>600</p> <p>500</p> <p>400</p> <p>300</p> <p>200</p> <p>100</p> <p>0</p>	<p>1000</p> <p>900</p> <p>800</p> <p>700</p> <p>600</p> <p>500</p> <p>400</p> <p>300</p> <p>200</p> <p>100</p> <p>0</p>	<p>1000</p> <p>900</p> <p>800</p> <p>700</p> <p>600</p> <p>500</p> <p>400</p> <p>300</p> <p>200</p> <p>100</p> <p>0</p>	<p>1000</p> <p>900</p> <p>800</p> <p>700</p> <p>600</p> <p>500</p> <p>400</p> <p>300</p> <p>200</p> <p>100</p> <p>0</p>

TABLE 10.
ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 6, 1904.

Readings taken from 2.30 to 2.35 P. M. of Potential Differences
between Pipe and Rail at Garden, Appleton and Fayerweather Streets
and Railroad Bridge.

Track bonded to Pipe at Washington Elm.

Garden Street at Washington Elm.	Huron Avenue at Appleton Street.	Huron Avenue at Fayerweather Street.	Huron Avenue at Railroad Bridge.
Pipe + V. M. No. 8072.	Pipe — V. M. No. 9531.	Pipe — V. M. No. 9725.	Pipe — V. M. No. 3921.
.50 Volts.	.50 Volts.	.60 Volts.	1.15 Volts.
.40	.48	.45	1.05
.45	.30	.65	1.15
.30	.28	.55	1.25
.35	.30	.80	1.50
.35	.35	.75	1.25
.50	.30	.65	1.45
.60	.32	.70	1.75
.55	.33	1.05	1.60
.40	.75	1.50	1.80
.55	.50	1.25	1.50
.45	.45	.95	1.60
.60	.70	.45	1.00
.55	.65	.30	1.05
.40	.15	.55	1.20
.60	.45	.70	.95
.40	.35	.80	1.25
.50	.25	.15	1.25
.55	.05	.90	1.50
.45	.55	1.00	.85
.55	.45	.85	.90
.45	.35	.65	.85
.40	.45	.85	.35
.45	— .00	Ave. .74	1.00
.40	.25	— .10	.60
.50	.50	.75	.50
.55	— .05	.15	.00
.50	.40	.75	.15
.45	— .00	— .10	.35
.50	— .00	— .15	.05
—	—	— .40	—
Ave. .47	.35		1.04

TABLE II

HYDROLYTIC INVESTIGATION ON 40 INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE

June 6, 1948

Readings taken between 315 and 320' w at Garden and Mason streets. Appledon Street and Huron Avenue, Park Avenue and Huron Avenue and Cushing Street and Huron Avenue under normal conditions. Garden and Mason Streets. Drop taken over 180 feet of 40 inch well pipe.

Clinton Street and Huron Avenue Drop taken over 6 feet, 8 inches of 6 inch steel pipe

1st Avenue and Huron Avenue Drop taken over 5 feet, 10 inches
 2d Avenue and Huron Avenue Drop taken over 5 feet, 10 inches

• 1000 West and Huron Avenue Drop taken over 5 feet, 10
 inches 1 1/2 inch east from pipe

Current flowing east		Current flowing west		Current flowing towards shore		Current flowing from shore	
M	A	M	A	M	A	M	A
1	10	1	10	1	10	1	10
2	10	2	10	2	10	2	10
3	10	3	10	3	10	3	10
4	10	4	10	4	10	4	10
5	10	5	10	5	10	5	10
6	10	6	10	6	10	6	10
7	10	7	10	7	10	7	10
8	10	8	10	8	10	8	10
9	10	9	10	9	10	9	10
10	10	10	10	10	10	10	10
11	10	11	10	11	10	11	10
12	10	12	10	12	10	12	10
13	10	13	10	13	10	13	10
14	10	14	10	14	10	14	10
15	10	15	10	15	10	15	10
16	10	16	10	16	10	16	10
17	10	17	10	17	10	17	10
18	10	18	10	18	10	18	10
19	10	19	10	19	10	19	10
20	10	20	10	20	10	20	10
21	10	21	10	21	10	21	10
22	10	22	10	22	10	22	10
23	10	23	10	23	10	23	10
24	10	24	10	24	10	24	10
25	10	25	10	25	10	25	10
26	10	26	10	26	10	26	10
27	10	27	10	27	10	27	10
28	10	28	10	28	10	28	10
29	10	29	10	29	10	29	10
30	10	30	10	30	10	30	10
31	10	31	10	31	10	31	10
32	10	32	10	32	10	32	10
33	10	33	10	33	10	33	10
34	10	34	10	34	10	34	10
35	10	35	10	35	10	35	10
36	10	36	10	36	10	36	10
37	10	37	10	37	10	37	10
38	10	38	10	38	10	38	10
39	10	39	10	39	10	39	10
40	10	40	10	40	10	40	10
41	10	41	10	41	10	41	10
42	10	42	10	42	10	42	10
43	10	43	10	43	10	43	10
44	10	44	10	44	10	44	10
45	10	45	10	45	10	45	10
46	10	46	10	46	10	46	10
47	10	47	10	47	10	47	10
48	10	48	10	48	10	48	10
49	10	49	10	49	10	49	10
50	10	50	10	50	10	50	10
51	10	51	10	51	10	51	10
52	10	52	10	52	10	52	10
53	10	53	10	53	10	53	10
54	10	54	10	54	10	54	10
55	10	55	10	55	10	55	10
56	10	56	10	56	10	56	10
57	10	57	10	57	10	57	10
58	10	58	10	58	10	58	10
59	10	59	10	59	10	59	10
60	10	60	10	60	10	60	10
61	10	61	10	61	10	61	10
62	10	62	10	62	10	62	10
63	10	63	10	63	10	63	10
64	10	64	10	64	10	64	10
65	10	65	10	65	10	65	10
66	10	66	10	66	10	66	10
67	10	67	10	67	10	67	10
68	10	68	10	68	10	68	10
69	10	69	10	69	10	69	10
70	10	70	10	70	10	70	10
71	10	71	10	71	10	71	10
72	10	72	10	72	10	72	10
73	10	73	10	73	10	73	10
74	10	74	10	74	10	74	10
75	10	75	10	75	10	75	10
76	10	76	10	76	10	76	10
77	10	77	10	77	10	77	10
78	10	78	10	78	10	78	10
79	10	79	10	79	10	79	10
80	10	80	10	80	10	80	10
81	10	81	10	81	10	81	10
82	10	82	10	82	10	82	10
83	10	83	10	83	10	83	10
84	10	84	10	84	10	84	10
85	10	85	10	85	10	85	10
86	10	86	10	86	10	86	10
87	10	87	10	87	10	87	10
88	10	88	10	88	10	88	10
89	10	89	10	89	10	89	10
90	10	90	10	90	10	90	10
91	10	91	10	91	10	91	10
92	10	92	10	92	10	92	10
93	10	93	10	93	10	93	10
94	10	94	10	94	10	94	10
95	10	95	10	95	10	95	10
96	10	96	10	96	10	96	10
97	10	97	10	97	10	97	10
98	10	98	10	98	10	98	10
99	10	99	10	99	10	99	10
100	10	100	10	100	10	100	10

TABLE 12.
ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 6, 1904.

Readings taken between 3.25 and 3.30 P. M. at Garden and Mason Streets, Appleton Street and Huron Avenue, Park Avenue and Huron Avenue, and Cushing Street and Huron Avenue.

Garden and Sparks Streets. Drop taken over 180 feet of 40-inch steel pipe.

Appleton Street and Huron Avenue. Drop taken over 6 feet, 8 inches of 40-inch steel pipe.

Park Avenue and Huron Avenue. Drop taken over 5 feet, 10 inches of 6-inch cast iron pipe.

Cushing Street and Huron Avenue. Drop taken over 5 feet, 10 inches of 12-inch cast iron pipe.

Bond between pipe and rail at Garden and Mason Streets.

GARDEN AND MASON. Current flowing east. M. V. M. No. 679.	APPLETON AND HURON. Current flowing east. M. V. M. No. 14449.	PARK AND HURON. Current flowing towards steel main. Inst. No. 4116.	CUSHING AND HURON. Current flowing towards steel main. M. V. M. No. 6789.
25. .35	.35	.45	.45
26. .15	.15	.30	.45
15. .18	.18	.40	.30
27. .40	.40	.55	.30
27. .40	.40	.45	.35
25. .42	.42	.70	.35
15. .45	.45	.65	.40
18. .40	.40	.60	.45
14. .45	.45	.50	.40
14. .45	.45	.60	.45
17. .45	.45	.45	.30
21. .30	.30	.45	.40
20. .32	.32	.55	.40
15. .35	.35	.80	.30
13. .40	.40	.55	.35
18. .40	.40	.55	.45
15. .38	.38	.65	.45
20. .40	.40	.45	.35
18. .45	.45	.50	.40
23. .42	.42	.45	.45
19. .40	.40	.65	.35
21. .35	.35	.50	.45
20. .40	.40	.40	.30
22. .40	.40	.35	.30
27. .38	.38	.40	.45
28. .30	.30	.40	.40
27. .40	.40	.30	.40
24. .45	.45	.25	.40
24. .35	.35	.20	.40
26. .25	.25	.25	.40
23. .			
18. .	Ave.=.372 M. V.	Ave.=.477	Ave.=.387 M. V.
25. .	45.1 Amp.	.61 M. V.	4.5 Amp.
29. .		2.6 Amp.	
30. .		Low reading supposed to be caused by poor contact.	
28. .			
25. .			
20. .			
21. .			
Ave.=21.6 =10.8 M. V. 41.4 Amp.			

TABLE 14.

ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 6, 1904.

Readings taken between 4.10 and 4.15 P. M. at Appleton Street, Reservoir Street, Park Avenue and Cushing Street on Huron Avenue.

Appleton Street. Drop taken over 6 feet, 7 inches of 40-inch steel pipe.

Reservoir Street. Drop taken over 9 feet, 8 inches of 20-inch cast iron pipe.

Park Avenue. Drop taken over 5 feet, 10 inches of 6-inch cast iron pipe.

Cushing Street. Drop taken over 5 feet, 10 inches of 12-inch cast iron pipe.

Pipe bonded to track at Appleton Street.

APPLETON STREET. Current flowing east. M. V. M. No. 14449.	RESERVOIR STREET. Current flowing towards steel main. M. V. M. No. 679.	PARK AVENUE. Current flowing towards steel main. Inst No. 4116.	CUSHING STREET. Current flowing towards steel main. M. V. M. No. 6799.
.25	.5	1.10	.35
.25	.8	1.25	.40
.28	.7	1.40	.35
.30	.6	1.40	.40
.25	.6	1.15	.40
.28	.6	1.55	.40
.35	.5	1.40	.35
.35	.4	1.45	.40
.35	.8	1.20	.40
.30	.8	1.40	.35
.28	.6	1.20	.40
.25	.5	1.45	.40
.22	.5	1.25	.30
.25	.7	1.00	.35
.20	.7	1.05	.35
.20	.6	1.00	.35
.15	.8	1.20	.35
.20	.7	1.00	.30
.15	.6	1.20	.25
.25	.5	1.45	.30
.25	.4	1.00	.35
.21	.7	1.30	.40
.25	.5	1.25	.30
.21	.8	1.20	.40
.20	.7	1.05	.40
.25	1.0	1.40	.35
.25	.7	1.20	.40
.25	.5	1.45	.40
.25	.5	1.25	.40
.25	.4	1.70	.40
.6			
Ave. = .25 M. V.	.7	Ave. = 1.26	Ave. = .37 M. V.
30.5 Amp.	.8	= 1.62 M. V.	4.3 Amp.
	.7	7.5 Amp.	
	.8		
	.7		
	.6		
	Ave. = .64 M. V.		
	10.3 Amp.		

TABLE 16.
ELECTROLYTIC INVESTIGATION ON 40-INCH STEEL PIPE,
HURON AVENUE, CAMBRIDGE.

June 9, 1904.

Excavation East of Appleton Street.

Comparison between drop over one section of 40-inch steel pipe 6.9 feet long, and a length, including 14 sections and 14 joints, 92.6 feet long,

Drop over 92.6 feet. Milli Volts.	Drop over 6.9 feet. Milli-Volts.	
5.2	.35	
5.2	.35	
5.4	.35	
5.1	.35	
Ave. 5.2		$\frac{5.20}{.35} = 14.9 \times 4 = 59.6$
4.4	.3	
4.8	.3	
4.8	.3	
4.6	.3	
4.6	.3	
4.6	.3	
4.4	.3	
4.4	.3	
4.6	.3	
4.8	.3	
Ave. 4.6		$\frac{4.60}{.30} = 15.3 \times 10 = 153.0$
4.2	.25	
4.0	.25	
4.2	.25	
4.2	.25	
3.9	.25	
3.8	.25	
Ave. 4.1		$\frac{4.10}{.25} = 16.4 \times 6 = 98.4$
3.4	.2	
3.4	.2	
3.4	.2	
3.4	.2	
3.2	.2	
3.0	.2	
3.0	.2	
3.2	.2	
3.0	.2	
3.4	.2	
2.9	.2	
3.0	.2	
Ave. 3.2		$\frac{3.20}{.20} = 16.0 \times 12 = 192.0$
2.4	.15	
2.5	.15	
Ave. 2.45		$\frac{2.40}{.15} = 16.3 \times 2 = 32.6$
		34 535.6

Average ratio between drops over 92.6 feet and 6.9 feet lengths = 15.8

Ratio between lengths = 13.4

Ratio between drop on pipe with joints and pipe without joints = 1.18

1
[]



General View of Hobbs Brook Basin, Looking North

R REGISTRAR

The Secretary of the

Board, December 1, 1904

Dear Sir: I have the honor to acknowledge the receipt of your letter of the 29th inst. and in reply to inform you that the same has been forwarded to the proper authorities for their consideration.

Very respectfully,
R. REGISTRAR

Enclosed

is

the

same

as

before

Yours truly,

R. REGISTRAR

Enclosed

is

the

same

as

before

Yours truly,

R. REGISTRAR

Enclosed

is

the

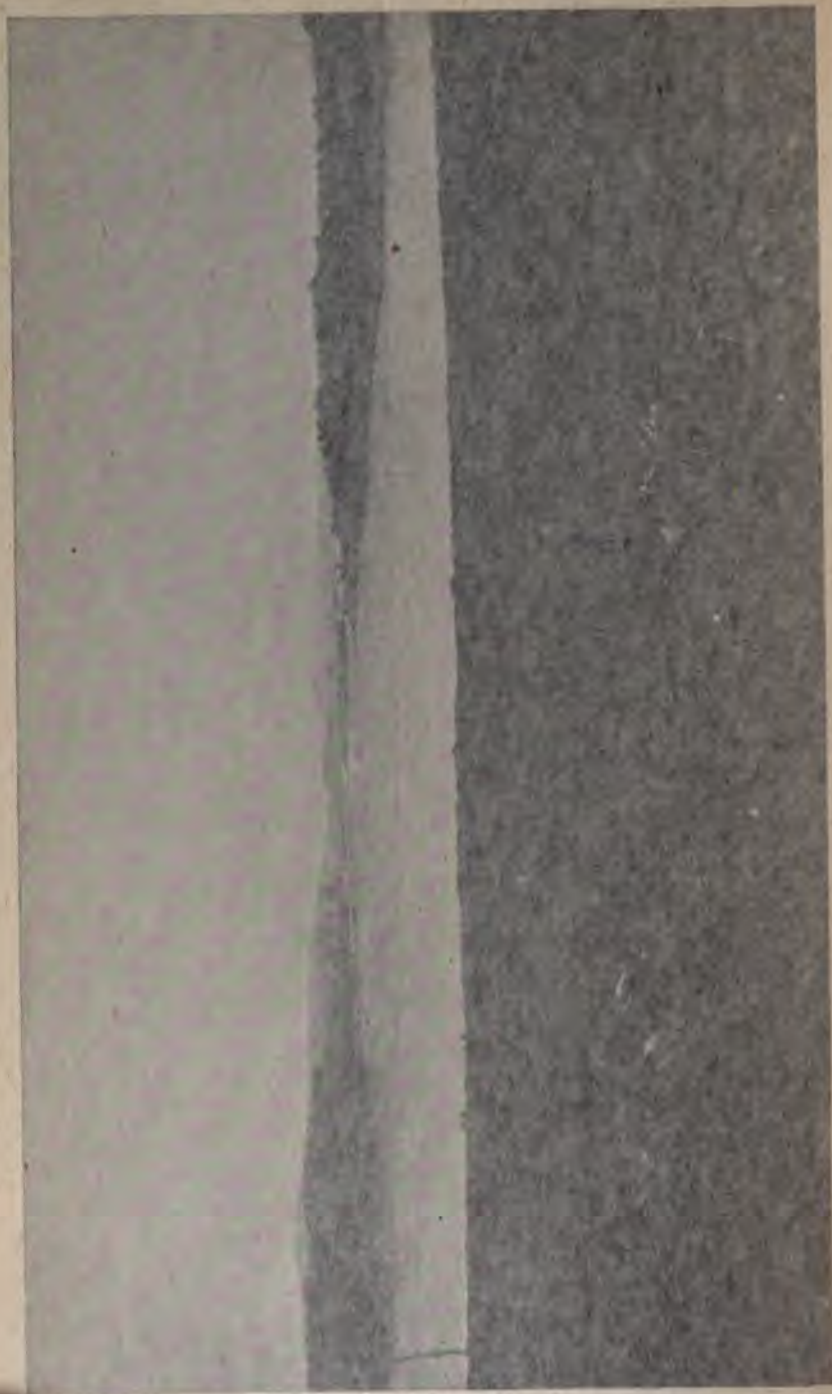
same

as

before

Yours truly,

R. REGISTRAR



General View of Hobbs Brook Basin, Looking North

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE.

CAMBRIDGE, December 1, 1904

to the Cambridge Water Board

GENTLEMEN In compliance with the requirements of the City Ordinance I present the fortieth annual report of the operations of this department showing the receipts, expenditures and balances, together with a statement of the number of water takers, etc., for the year ending November 30, 1904

Amount of bills remaining unpaid November 30, 1904

water rates	\$4,477 73
repairs and repairs	749 45
fund on	150 00
misc	10 00
miscellaneous account	620 96
construction account	249 33

Amount of bills placed in hands of City Treasurer for collection from November 30, 1904, to November 30, 1904

water rates	\$4,477 73
repairs and repairs	749 45
fund on	617 00
misc	100 00
misc	99 25
miscellaneous account	1,004 75
construction account	2,002 37

Total bills

\$26,934 00

There has been collected

water rates	\$4,477 73
repairs and repairs	749 45
fund on	617 00
misc	100 00
misc	99 25
miscellaneous account	1,004 75
construction account	2,002 37

There has been abated : —

Water rates, off and on, and seals, supplies and repairs, and Construction account	3,917 88
---	----------

There remains uncollected : —

Water rates	\$5,410 37	
Supplies and repairs	778 18	
Off and on	150 00	
Seals	8 50	
Maintenance account	602 62	
Construction account	156 26	
	<hr/>	\$360,934 00

EXPENDITURES.

Construction (General account)	\$21,851 98	
Maintenance (General account)	97,845 40	
	<hr/>	\$119,697 38

ABATEMENTS.

Water rate, Construction and supply and repair bills to the amount of	\$3,917 88
--	------------

REFUNDS.

Water rates to the amount of	\$3,873 75	
Which amount deducted from receipts	343,488 02	
	<hr/>	
Leaves net receipts for water	\$339,109 27	
Add off and on, fines, rents, seals and Maintenance account	1,964 32	
	<hr/>	
Makes net receipts of rates, fines, etc.		\$341,073 59

OFF AND ON.

Water has been shut off for non-payment of rates, or per order on account of vacancy, and seals have been applied to fixtures by request of owners, as follows : —

Water shut off in 1904	731
Supplies let on, shut off in 1904	565
Supplies let on, shut off in previous years	98
New supplies let on	110
Seal locks applied to fixtures in 1904	543
Seal locks removed, put on in 1904	301
Seal locks removed, put on in previous years	249

Statement of yearly revenue received from water rates since the purchase of the works by the City : —

From April 28, 1865, to December 1, 1865	\$32,267 19
From December 1, 1865, to December 1, 1866	40,073 27
From December 1, 1866, to December 1, 1867	53,733 63

WATER RESOURCES

79

From November 1, 1947, to November 1, 1948	943,747 49
From November 1, 1948, to November 1, 1949	74,149 30
From November 1, 1949, to November 1, 1950	97,603 96
From November 1, 1950, to November 1, 1951	111,749 63
From November 1, 1951, to November 1, 1952	127,901 30
From November 1, 1952, to November 1, 1953	146,117 29
From November 1, 1953, to November 1, 1954	153,634 27
From November 1, 1954, to November 1, 1955	154,480 27
From November 1, 1955, to November 1, 1956	179,166 76
From November 1, 1956, to November 1, 1957	154,843 59
From November 1, 1957, to November 1, 1958	157,443 91
From November 1, 1958, to November 1, 1959	161,641 90
From November 1, 1959, to November 1, 1960	173,323 49
From November 1, 1960, to November 1, 1961	170,063 73
From November 1, 1961, to November 1, 1962	177,130 80
From November 1, 1962, to November 1, 1963	171,341 89
From November 1, 1963, to November 1, 1964	161,394 27
From November 1, 1964, to November 1, 1965	163,544 36
From November 1, 1965, to November 1, 1966	177,404 43
From November 1, 1966, to November 1, 1967	214,744 44
From November 1, 1967, to November 1, 1968	211,134 27
From November 1, 1968, to November 1, 1969	221,194 70
From November 1, 1969, to November 1, 1970	231,114 22
From November 1, 1970, to November 1, 1971	247,854 53
From November 1, 1971, to November 1, 1972	237,327 08
From November 1, 1972, to November 1, 1973	242,919 78
From November 1, 1973, to November 1, 1974	251,023 71
From November 1, 1974, to November 1, 1975	244,018 42
From November 1, 1975, to November 1, 1976	261,030 00
From November 1, 1976, to November 1, 1977	271,437 62
From November 1, 1977, to November 1, 1978	277,179 76
From November 1, 1978, to November 1, 1979	272,349 70
From November 1, 1979, to November 1, 1980	319,679 27
From November 1, 1980, to November 1, 1981	321,648 81
From November 1, 1981, to November 1, 1982	323,300 13
From November 1, 1982, to November 1, 1983	333,777 34
From November 1, 1983, to November 1, 1984	339,108 27

COMPARATIVE STATEMENT.

	1903.		1904.	
CONSTRUCTION ACCOUNT. (HOBBS BROOK RESERVOIR.)				
<i>Received.</i>				
From surplus receipts.....		\$12,229 61		\$797 84
From bonds issued.....				
<i>Expended.</i>				
Construction of reservoir, land settlements, services of City Solicitor, etc.....		12,229 61		797 84
Balance to credit of Construction Account.....				
CONSTRUCTION ACCOUNT. (GENERAL.)				
<i>Received.</i>				
From City of Waltham and sale of old materials.....	\$5,727 85		\$2,145 64	
From bonds issued.....	11,025 61			
From surplus receipts.....	9,717 54		6,261 44	
Balance from 1903.....			12,647 06	
From premium on bonds.....		\$26,471 00		\$21,054 14
<i>Expended.</i>				
Sundry bills and pay rolls.....	\$8,429 25		\$13,800 88	
Meters and setting.....	2,212 51		3,889 12	
Examination of Stony Brook main	3,482 18		3,454 03	
Balance to credit of Construction Account.....	12,347 06			
		26,471 00		21,054 14
MAINTENANCE ACCOUNT.				
<i>Received.</i>				
From "rates, fines, etc.".....	\$341,604 60		\$347,217 15	
From supply and repair account.	4,260 50		3,372 21	
From sale of shrubs, grass, etc...	669 35		1,088 07	
Interest for 1902 reappropriated..	3,160 00		4,280 00	
		\$349,694 45		\$355,962 43
<i>Expended.</i>				
Care and repairs.....	\$21,649 90		\$27,673 50	
Work at Fresh Pond.....	5,840 70		9,996 83	
Plyson Park Reservoir.....	801 81		784 33	
Hobbs Brook Reservoir.....	1,203 07		1,468 64	
Stony Brook.....	4,025 28		2,999 96	
Supplies and repairs, pipes and fittings.....	2,499 90			
Salaries.....	7,103 58		9,463 50	
Pumping, salaries and other ex- penses.....	20,704 71		17,298 19	
Ice for drinking fountains.....	460 56		460 35	
Refunds.....	3,169 06		3,373 75	
Abatements.....	8,756 43		3,917 88	
Sinking fund.....	121,532 50		121,522 50	
Interest on water debt.....	128,806 50		126,126 50	
Transferred to Construction Ac- count.....	21,947 15		7,059 28	
Interest on water debt reappro- priated.....	4,280 00			
Excess of receipts.....	1,923 28			
Fresh Pond grading.....			12,500 00	
Purchase of Metropolitan water..			14,000 00	
Rent.....			1,200 00	
		349,694 45		356,845 31
Maintenance account, excess of receipts.....				
		\$1,923 28		
Maintenance account, deficit in receipts.....				
				\$3,882 86

In addition to the customary expenditures, there has been paid this year from the receipts from water the following amounts, viz :

Construction Account	87,627 28
Metropolitan water	15,318 00
Grading at Fresh Pond Reservoir	12 34 00
	<hr/>
	\$114,717 28

If the above unusual expenditures had not occurred, there would have been excess receipts of over \$10,000,000.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 17,052 families, 527 stables, 2,500 houses, 68 cows, 154 shops, 257 offices and stores, by the following fixtures, viz :

19 082 faucets	23 urinals
7 367 wash basins	7 yard hydrants
10 000 wash tubs	1 fountain
6,017 bath tubs	12 tubular washers
166 ship closets	1,673 hand hose
17 697 water closets	3 meters
2 hopper closets	

And

- 1 010 fire hydrants (hooked 19 on private premises)
- 6 fire reservoirs
- 70 drinking fountains in public squares
- 61 street watering stand-pipes
- 6 public sanitation.

The above schedule of fixtures does not include those in school-houses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made.

Respectfully submitted,

WALTER H. HARDING,

Register

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1904

Uncollected November 30, 1903: —

Water rates	\$4,622 73	
Supplies and repairs	769 45	
Off and on	130 00	
Seals	10 00	
Construction account	269 33	
Maintenance account	600 96	
		<u>\$6,402 47</u>

Bills placed in the hands of City Treasurer for collection from December 1, 1903, to December 1, 1904: —

Water rates	\$347,107 78	
Supplies and repairs	3,391 70	
Off and on	637 00	
Rents	168 00	
Seals	99 75	
Maintenance account	1,094 73	
Construction account	2,032 57	
		<u>354,531 53</u>
Total bills		<u>\$360,934 00</u>

There has been collected: —

Water rates	\$342,483 02	
Supplies and repairs	3,372 21	
Off and on	604 00	
Rents	168 00	
Seals	99 25	
Maintenance account	1,093 07	
Construction account	2,090 64	
		<u>\$349,910 19</u>

There has been abated: —

Water rates, off and on, and seals, supplies and repairs, and Construction account	\$3,917 88
--	------------

STATEMENT OF THE WATER REGISTRAR

43

There remains uncollected

Water rates	\$5 410 37
Supplies and repairs	770 16
Off and on	180 00
Seams	2 50
Maintenance account	607 67
Construction account	154 74

\$7 105 93

Total bills for collection

\$140 934 00

Less stated

\$1 917 48

Less refunded

8,378 75

Less unpaid

7,104 93

\$14 397 86

Net receipts

\$364 136 04

Attest

WALTER H. HARDING,

Registrar

Commenced December 1906

We have examined the accounts of the Water Registrar and find that they correspond in the amounts collected stated refunded and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor

Committee on Accounts

CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER.

To the Cambridge Water Board :—

I give you herewith a record of the transactions between the Water Office and the City Treasurer's Office during the year ending November 30, 1904.

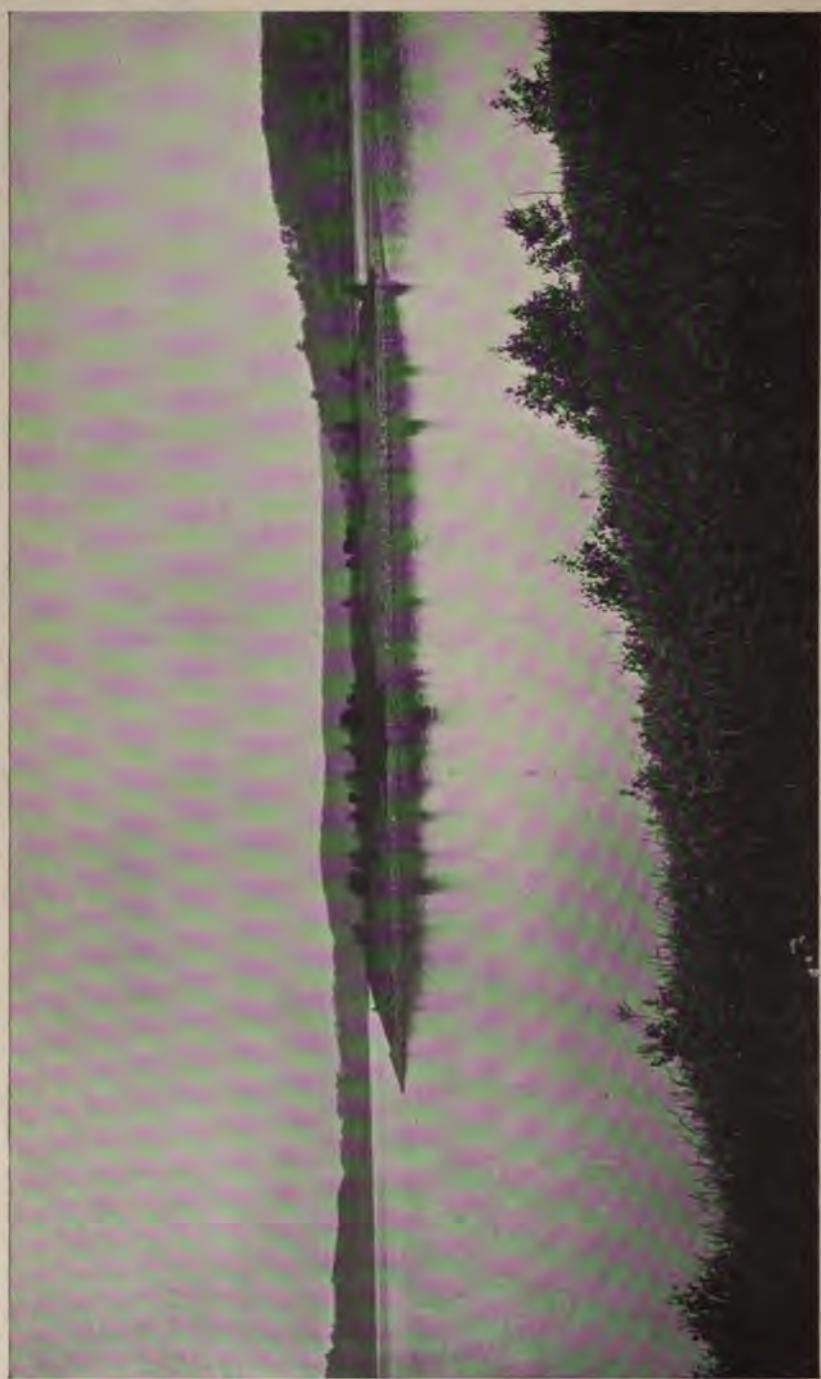
Gross collections for account of Water Works—"Maintenance,"	
"Water Rates" and "Supply" Accounts	\$351,682 43
Gross collections for account of Water Works—"Construction"	
Account	2,145 64
"Abatement" certificates received and paid on "Water Rates" .	3,917 88
"Refund" certificates received and paid to amount of	3,373 75
Uncollected bills in my hands November 30, 1904, for account of	
"Water Rates," "Maintenance" and "Supply" Accounts .	6,949 67
Uncollected bills November 30, 1904, for account of "Construction"	158 28

Very respectfully,

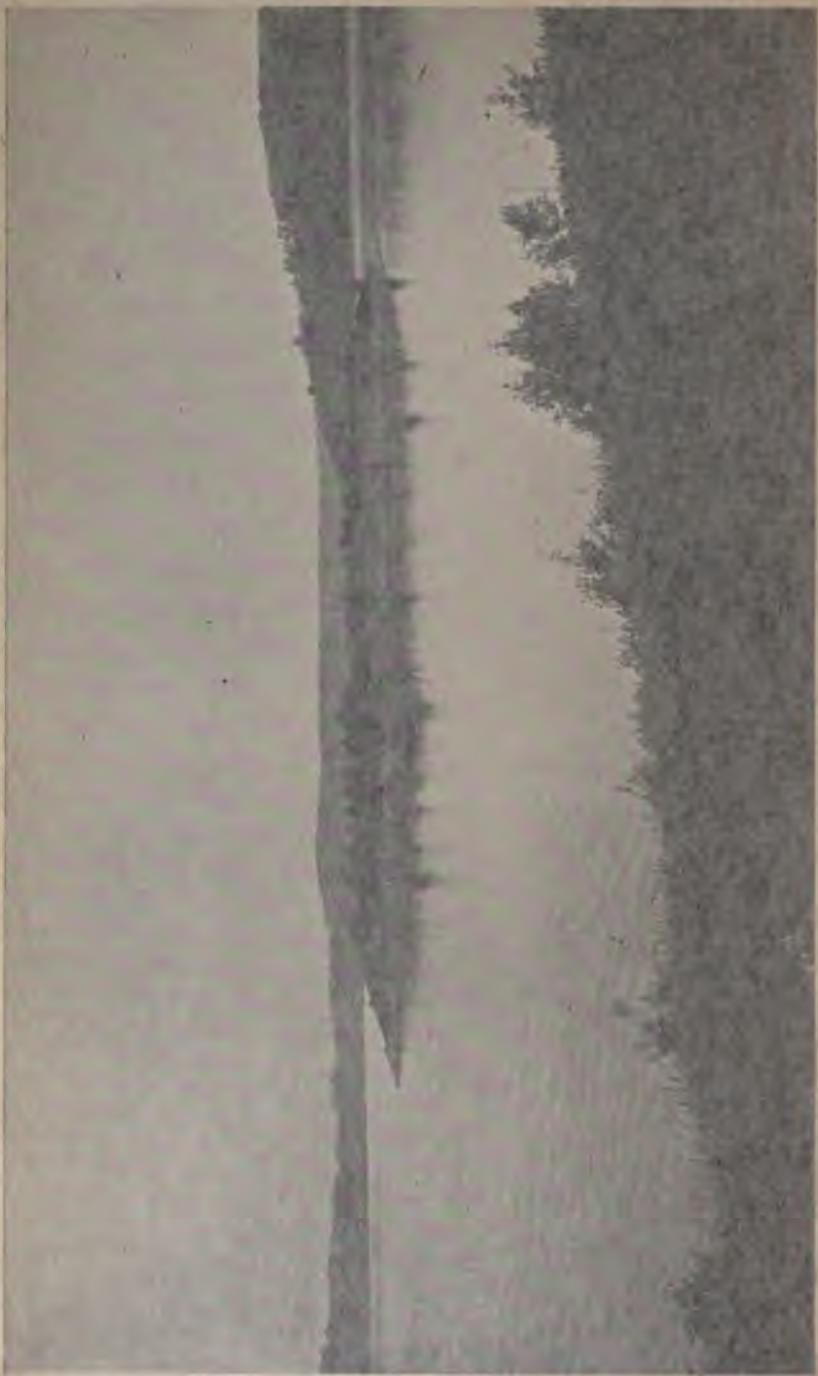
WM. W. DALLINGER,
City Treasurer.

I have examined the above statement and find it correct.

HARRY T. UPHAM,
City Auditor.



View of Central Portion of Hobbs Brook Basin



View of Central Portion of Hobbs Brook Basin

REPORT OF THE SUPERINTENDENT OF WATER WORKS

CAMBRIDGE, December 3, 1904

To the Honorable Water Board of the City of Cambridge

GENTLEMEN:—Complying with the City Ordinance, I herewith present the annual report of the Superintendent for the year ending November 30, 1904.

Total water pumped	2,412,462.165
Total water purchased from Metropolitan Water and Sewerage Board	17,400,000
Total water consumed	1,710,462.165
Quantity of water sold by meter	1,143,745.720
Quantity of water used for sprinkling streets	100,000.000
Quantity of water used for flushing sewers	2,000,000
Quantity of water used for clearing canals	100,000
Quantity of water used for public fountains	20,000,000
Quantity of water used for drinking fountains	100,000
Quantity of water used for testing meters	6,125
Quantity of water used for fire purposes	5,000,000

Number of gallons daily for each class, and of the total amount received, \$20.25

COMPARATIVE STATEMENT OF TOTAL GALLONS DELIVERED FOR THE LAST TEN YEARS

Year	Total Gallons Delivered	Increase or Decrease	Average Daily Delivery	Increase or Decrease	Total Gallons Delivered
1904	1,710,462.165	21,000,000 increase	4,686.22	10,000 increase	1,710,462.165
1903	1,689,462.165	22,000,000 increase	4,626.22	10,000 increase	1,689,462.165
1902	1,667,462.165	17,000,000 increase	4,566.22	10,000 increase	1,667,462.165
1901	1,650,462.165	16,000,000 increase	4,506.22	10,000 increase	1,650,462.165
1900	1,634,462.165	15,000,000 increase	4,446.22	10,000 increase	1,634,462.165
1899	1,618,462.165	14,000,000 increase	4,386.22	10,000 increase	1,618,462.165
1898	1,602,462.165	13,000,000 increase	4,326.22	10,000 increase	1,602,462.165
1897	1,586,462.165	12,000,000 increase	4,266.22	10,000 increase	1,586,462.165
1896	1,570,462.165	11,000,000 increase	4,206.22	10,000 increase	1,570,462.165
1895	1,554,462.165	10,000,000 increase	4,146.22	10,000 increase	1,554,462.165

Total amount of cash received	\$1,710,462.165
Amount received in 1904 from Metropolitan Water and Sewerage Board supplied to	\$1,710,462.165
Total amount used for pumping purposes	\$1,710,462.165
Total average amount used for pumping purposes in 1904	\$1,710,462.165
Total average total amount received	\$1,710,462.165

Coal consumed per million gallons pumped	1,272 lbs.
Highest water elevation in Fresh Pond was on June 4th	17.09
Lowest water elevation in Fresh Pond was on February 28th	9.42
Average height of water in Fresh Pond	12.68
Highest water elevation in Stony Brook Reservoir was on April 30th	83.04
Lowest water elevation in Stony Brook Reservoir was on July 17th	79.79
Highest water elevation in Hobbs Brook Reservoir No. 1, Lincoln Street, was on April 30th	182.05
Lowest water elevation in Hobbs Brook Reservoir No. 1, Lincoln Street, was on September 14th	180.15
Highest water elevation in Hobbs Brook Reservoir No. 2, Winter Street, was on April 30th	182.00
Lowest water elevation in Hobbs Brook Reservoir No. 2, Winter Street, was on November 13th	178.50
Total rainfall at Fresh Pond Pumping Station	42.80
Total rainfall at Stony Brook Reservoir	41.18
Total rainfall at Hobbs Brook Reservoir	39.95

TOTAL RAINFALL FOR THE PAST TEN YEARS.

Month.	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
December.....	4.43	1.90	1.63	4.31	2.00	1.30	1.74	7.71	4.37	2.87
January.....	3.57	2.46	3.32	4.75	3.85	4.40	1.55	1.97	3.19	5.00
February.....	1.07	5.62	2.36	3.61	3.99	7.34	.79	4.29	3.50	3.00
March.....	2.68	4.37	2.66	2.03	5.94	5.10	6.89	6.16	4.89	2.35
April.....	4.15	1.70	2.82	6.22	1.32	1.99	8.80	3.56	3.93	8.57
May.....	2.39	2.42	4.24	3.92	.77	5.52	6.96	1.08	.35	3.58
June.....	2.76	2.33	5.16	1.82	3.17	2.75	1.33	2.40	8.46	2.74
July.....	3.28	2.65	4.68	4.50	3.12	2.31	4.70	3.14	3.72	1.70
August.....	4.71	2.45	5.06	7.34	3.21	2.80	4.17	3.62	3.81	2.53
September.....	1.83	6.29	3.22	1.78	4.63	4.40	3.74	3.36	1.72	5.67
October.....	10.16	3.10	.55	7.22	3.08	3.75	2.86	4.65	4.54	1.85
November.....	6.09	3.53	6.83	4.92	2.20	5.25	2.67	1.37	1.70	2.83
Total.....	47.12	38.82	42.53	52.42	37.28	46.89	46.20	43.31	44.23	42.89

FRESH POND AND SURROUNDINGS.

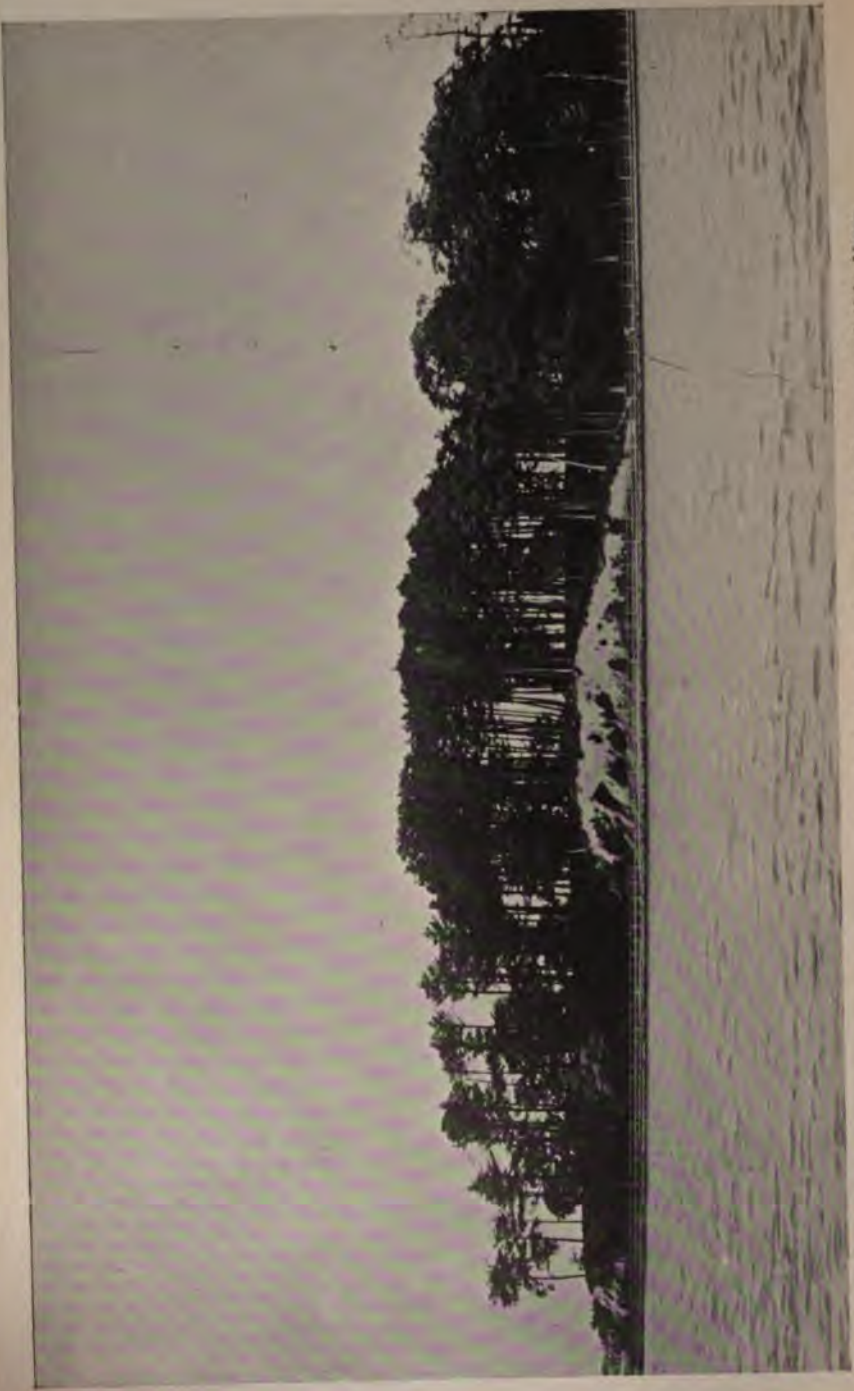
The work of caring for the grounds, walks and roads about the Pond this year has employed more help than last, and the condition has been much more satisfactory.

The work of improving that portion of the borders of the Pond known as Kingsley Park, in accordance with the plans of Messrs. Olmsted Brothers, was begun on August 29th, and has continued to the present time, giving employment to some sixty men, and twenty to thirty teams. The work has so far progressed that a comparatively small appropriation will be necessary to finish it.

On April 27th, the water in the Pond having fallen to grade 10.90, it was deemed wise by the Water Board to purchase water from the

.

7



Fresh Pond Grove and Grounds, where Work of Grading was Commenced this Year

Water and Sewerage Board to supply the City while the Fresh Pond was filling. According to the gate being through the line located in the Cambridge Channel was closed while the City supplied through the Aqueduct under the bridge until June 4th, when the Pond had nearly attained supply was shut off.

Fresh Pond was resumed on that date.

Water was consumed by the City while the gate was open as follows:

June 21 - Fresh Pond level having fallen to 11.24. No gate assistance as are at present being supplied with Mettens water.

Long line around the Pond, not needed by the water supply, is at present in use.

Hereafter the Board for the year may open 12.68.

STATE OF NEW YORK.

IN SENATE,

JANUARY 1868.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE, IN ANSWER TO A RESOLUTION PASSED BY THE SENATE, APRIL 1867, RELATIVE TO THE LANDS BELONGING TO THE STATE.

ALBANY: PUBLISHED BY THE STATE PRINTING OFFICE, 1868.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE, IN ANSWER TO A RESOLUTION PASSED BY THE SENATE, APRIL 1867, RELATIVE TO THE LANDS BELONGING TO THE STATE.

ALBANY: PUBLISHED BY THE STATE PRINTING OFFICE, 1868.



Metropolitan Water and Sewerage Board to supply the City while the water from Stony Brook was filling Fresh Pond. Accordingly, the gate on the forty-eight inch line, located in the Cambridge Common, was opened on April 27th, and the City supplied through the Venturi meter connected with the same, until June 4th, when the Pond had risen to grade 17.09 and the supply was shut off.

The pumping from the Pond was resumed on that date.

The amount of water consumed by the City while the gate was open was 331,540,000 gallons.

On November 24th, the Pond level having fallen to 11.99, the gate was again opened and we are at present being supplied with Metropolitan water.

The standing grass around the Pond, not needed by the department, has been sold at public auction.

The average height of the Pond for the year has been 12.68.

FRESH POND RESERVOIR.

				INTAKE GATE.			
				This gate has been closed daily for one-half hour in the morning and one-half hour in the afternoon, i. e., 8 to 8.30 a. m. and 4 to 4.30 p. m. for the purpose of expelling the air from the Stony Brook main.			
	Lowest Elevation During Month.	Highest Elevation During Month.	Monthly Rainfall.	8-inch Opening.		30-inch Opening.	
				Opened.	Closed.	Opened.	Closed.
1903							
December 3.	.....	11.60	.....	During entire year, 28 turns		During entire year, 30 inches	
December 31.	11.14	.....	2.87				
1904							
January 1.	.....	11.08	.....			
January 31.	10.26	.....	5.				
February 1.	.....	10.31	.....			
February 28.	9.42	.....	3.				
March 1.	9.42	.....	.....		
March 31.	.....	10.52	2.35				
April 1.	10.51	.....	.....		
April 30.	.....	12.06	8.57				
May 1.	12.26	.....	.....		
May 31.	.....	16.62	3.58				
June 4.	.....	17.09	.....			
June 29.	15.86	.....	2.74				
July 1.	.....	15.90	.....			
July 30.	14.55	.....	1.70				
August 1.	.....	14.69	.....			
August 29.	13.65	.....	2.53				
September 1.	.....	13.80	.....			
September 29.	13.23	.....	5.87				
October 1.	.....	13.36	.....			
October 31.	12.51	.....	1.85				
November 24.	11.99	.....	.....		
November 30.	.....	12.83	2.83				
			42.89				

PUMPING STATION AND GROUNDS.

The buildings at the station have been painted and are in good condition.

The grounds have received the usual care.

On September 10th, Mr. E. I. Harris, who had been Chief Engineer since May 1, 1898, resigned, and Mr. William H. Blaisdell, for the past fourteen years Assistant Engineer, was appointed Chief Engineer.

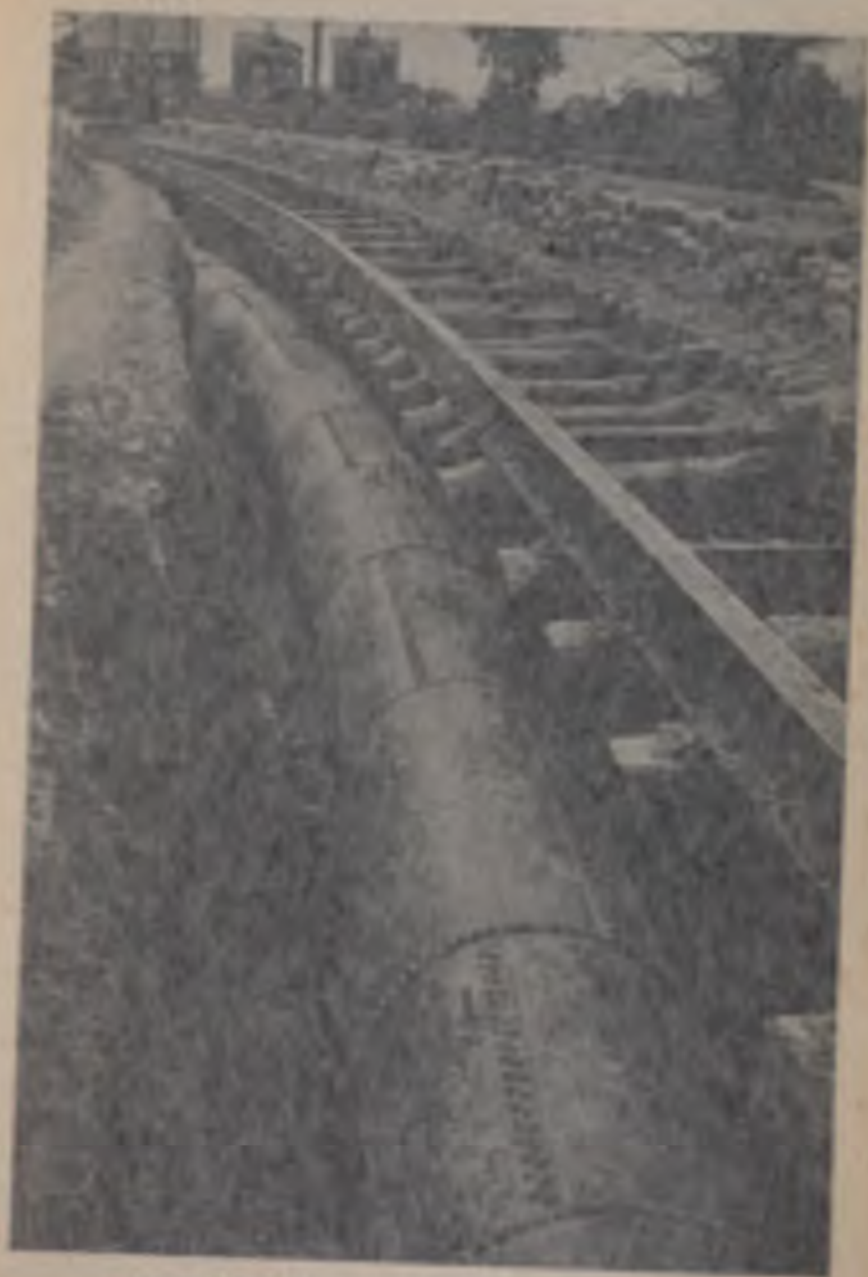
Mr. George F. Haven has been appointed Assistant Engineer, to succeed Mr. Blaisdell.

The engines and boilers have received but slight repairs in the past year; but during the time when the engines have been stopped opportunity has been given for making the necessary cleaning, inspection and repairs

[illegible]

OPERATING EXPENSES AT PUMPING
STATION.

Buildings, repairs and painting	\$1,103.05
Coal	7,998.73
Express	16.34
Ice	29.00
Lighting	83.28
Oil, grease and packing	467.88
Repairs, boiler	123.61
Repairs, engines	195.06
Telephone	60.74
Tools and hardware	65.22
Miscellaneous	66.03
Salaries	7,089.25
	<hr/>
	\$17,298.19



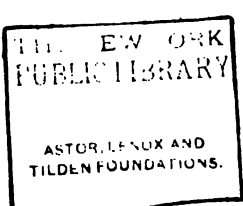
40-inch Steel Main at Appleton Street, Before Repair

OPERATING EXPENSES AT PUMPING STATION

Buildings, repairs and painting	\$1,193.05
Coal	7,998.73
Expenses	16.34
Ice	20.00
Lighting	83.28
Oil, grease and packing	467.88
Repairs, boiler	123.61
Repairs, engines	195.06
Repairs, pumps	60.74
Telephone service	63.22
Miscellaneous	16.73
Subtotal	7,089.25
	<hr/>
	\$17,298.40



40-inch Steel Main at Appleton Street, Before Repairs



THE FORTY INCH STEEL DISTRIBUTING MAINS

During the month of March, last, a leak occurred on this line near Broadway Street, and upon digging down we found a hole about five-eighths of an inch in diameter through the pipe and pittings around the hole that seemed to indicate electrolysis. A further examination showed that the pipe was in such condition that a thorough examination was necessary and consequently about four hundred feet were uncovered, a total length more than four hundred pittings were found.

During the time of investigation and repair, when hoists developed, we were to agree temporarily with the police.

adjacent to the section near Appleton Street, another section between Fayerweather Street and Lake View Avenue developed three zones of contamination showed it to be in fact somewhat, in some respects worse, if possible, than the portion near Appleton Street, as will be seen in the accompanying map. For which we are indebted to Mr. Dexter Fox, City Engineer of Department of Metropolitan Water and Sewerage Board, as well as for some of the details of the general report.

7. The latter of the repair of the pipe was done on

As the same time, the fact that the primary means of aid had been reduced to the barest and begged that it was necessary to report to the nearest station points connected to this road.

Efforts to cover the patient affected were made at first with the inch wide adhesive tape to the shape of the wound to be repaired, and a garment of the best rubber packing material was latterly used. This was a very good rubber patch. These patches and garments were then held by means of a rubber webbing strap. Where the wound was a large vertical one, the latter, etc., a garment was used, etc., etc.

1. The first group of variables includes the following:

A full investigation of the nature of the disease which had been made by Mr. Charles H. Murray, expert for the Water District, and reported to the Board of Directors. It was found that Mr. Murray of the Engineering Department of the Metropolitan Water Works. The report of Mr. Murray is attached.

[illegible]

Insulating joints have been placed in Reservoir Street in the twenty-inch (20-in.) cast iron main, connecting to the forty-inch (40-in.) steel line; and in the twelve-inch (12-in.) line in Cushing Street.

One insulating joint in the six-inch (6 in.) line in Park Avenue remains to be placed.

These joints are of the same design as those used by the Metropolitan Water Works, a sketch of which is shown.

The forty-inch (40-in.) pipe has also been connected to the rails of both tracks at Sparks Street with a suitable switch, and stations for observation have been made at different points on the line.

PAYSON PARK RESERVOIR.

The grounds about the reservoir are in good condition.

The gate house will need to have the stone work thoroughly pointed and the wood work painted this season.

PIPE YARD.

The dwelling house and shed should be shingled and the stable have new doors this season.

The shop will need no repairs.

HIGH SERVICE.

Following is the list of streets supplied from the high service : —

Agassiz Street.	Holly Avenue.
Appleton Street, from Highland Street to beyond Hutchinson Street.	Humboldt Street.
Arlington Street.	Huron Avenue, from Appleton Street to Raymond Street.
Avon Hill Street.	Lancaster Street.
Bates Street.	Linnaean Street.
Bellevue Avenue.	Mount Pleasant Street.
Bellevue Avenue, west.	Raymond Street, from Linnaean Street to Walden Street.
Buena Vista Park.	Reservoir Street, from Highland Street.
Concord Avenue, from Huron Avenue to Buckingham Street.	Upland Road, from Richdale Avenue to Huron Avenue.
Garden Street, from Huron Avenue to Linnaean Street.	Vassal Lane from Huron Avenue.
Highland Street, from Reservoir Street to Appleton Street.	Vincent Street.
Hillside Avenue.	Walnut Avenue.
	Washington Avenue.



48-inch Steel Main at Appleton Street, After Repair

The repairs on this main necessitated a great expense which was not anticipated nor provided for in our annual appropriation. The cost of labor alone was fourteen hundred fifty dollars and fifty cents (\$1,450.50).

The following account of leaks were reported by our inspectors and were found by them on the annual canvass:—

Three hundred sixty-one (361) on faucets.

Fourteen hundred thirty-two (1,432) on water closets.

Twenty-eight (28) on pipes.

Twelve (12) on tanks.

Fourteen (14) on basins.

Eight (8) on bath tubs.

Five (5) on set tubs.

Five (5) on stops and wastes.

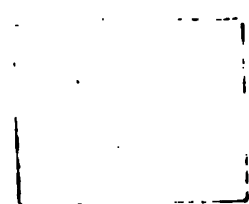
TABLE SHOWING GAIN IN THE TOTAL CONSUMPTION FOR THE
YEAR 1904 OVER THE YEAR 1903.

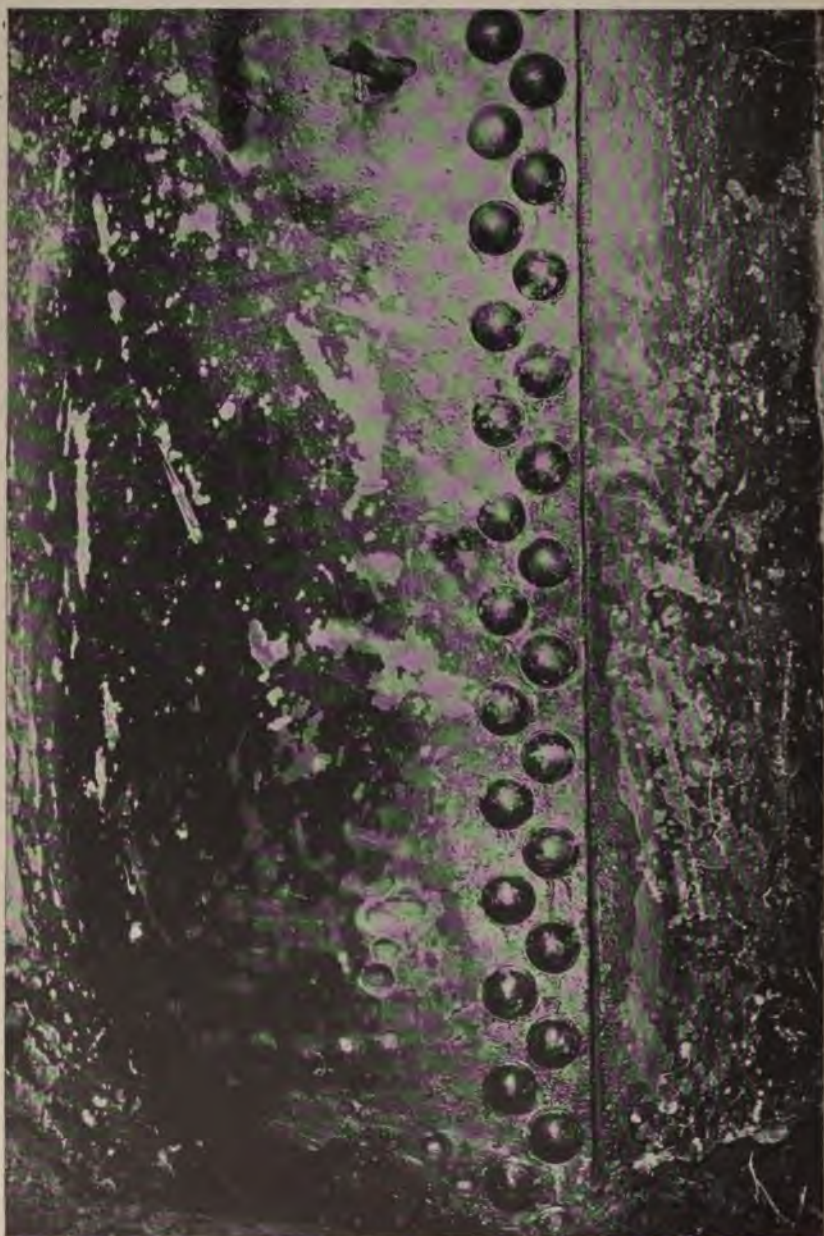
	Total Consump- tion 1904.	Total Consump- tion 1903.	Increase.	Decrease.
1903				
December.....	275,246,840	281,443,360	.....	6,196,520
1904				
January	304,044,400	301,018,080	3,026,320	.....
February.....	292,277,480	250,631,040	41,646,440	.....
March.....	260,823,640	254,024,760	6,798,880	.....
April.....	242,749,840	244,855,160	.....	2,105,320
May.....	274,400,600	281,320,600	.....	6,920,600
June.....	266,626,785	278,104,640	.....	11,477,855
July.....	271,314,120	282,725,080	.....	11,410,960
August.....	262,107,120	247,052,080	15,055,040	.....
September.....	252,276,200	239,901,640	12,374,560	.....
October.....	265,614,800	259,578,880	6,035,920	.....
November.....	243,500,920	240,049,040	3,451,880	.....
Total.....	3,210,982,145	3,160,704,360	50,277,785	.....

MAIN PIPE.

Five thousand, one hundred seventy-four and one-half (5,174½) feet of main pipes have been laid during the year, of which one thousand, four hundred eleven and one-half (1,411½) feet were laid for extensions, and three thousand, seven hundred sixty-three (3,763) feet were laid for renewals of main pipes which had been in use for many years.

The tables of main pipes laid will be found on pages 57 and 67.





40-inch Steel Main at Appleton Street

The following named streets are those in which the main pipes have been renewed —

In Harvard Street, from Hancock Street to corner to ten-inch main laid in 1863, four hundred sixty (460) feet of ten-inch pipe have been laid; this will take the place of the six-inch pipe formerly in this location, which was inadequate and old, having been laid in 1867.

In Lake Street, from Magazine Street to Pearl Street, the old six-inch main, laid in 1868, has been removed and four hundred fifty (450) feet of six-inch pipe have been laid.

In Park Street, from Magazine Street to Pleasant Street, five hundred forty-seven (547) feet of six-inch pipe have been laid; the old four-inch pipe, which has supplied this vicinity since 1867 and 1870, has been removed.

In Ferry Street, from Magazine Street to Pearl Street, four hundred forty-seven (447) feet of six-inch pipe have been laid; a four-inch pipe has previously supplied this section and has been in use since it was first laid, three different years, *i. e.*, 1868, 1870 and 1872.

In River Street, from Blackstone Street and connected with sewer by a blow-off, three hundred fifty-four (354) feet have been laid; the department has removed the six-inch pipe which has supplied this section since 1872.

In Blackwell Street, from Pleasant Street to River Street, four hundred twenty-two (422) feet of six-inch pipe have been laid; the four-inch pipe, laid in 1868, has been removed.

In Union Street, from Magazine Street to Pleasant Street, the old six-inch pipe, laid in 1867, has been replaced by five hundred thirty-six (336) feet of six-inch pipe.

In Warland Street, from Magazine Street to Pleasant Street, five hundred seven (507) feet of six-inch pipe have been laid; the old four-inch pipe, part of which was laid in 1867, and a part in 1872, has been removed.

The inspection and blowing off of all the main pipes in the City has been found to be of much benefit to the condition of the water and how may be considered an annual necessity.

This Spring it was again made under the direction of a foreman in the department with good results.



40-inch Steel Main at Appleton Street

The following named streets are those in which the main pipes have been renewed:

In Harvard Street, from Hancock Street to connect to ten inch main laid in 1903, four hundred sixty (460) feet of ten inch pipe have been laid. This will take the place of the six inch pipe formerly in this location, which was inadequate and old, having been laid in 1867.

In Lake Street, from Magazine Street to Pearl Street, the old six inch main, laid in 1868, has been removed and four hundred fifty (450) feet of six inch pipe have been laid.

In Park Street, from Magazine Street to Pleasant Street, five hundred forty seven (547) feet of six inch pipe have been laid. The old four inch pipe which has supplied this vicinity since 1867 and 1869, has been removed.

In Perry Street, from Magazine Street to Pearl Street, four hundred forty nine (449) feet of six inch pipe have been laid. A four inch pipe has previously supplied this section and has been in use since it was first laid, three different years, i. e., 1868, 1870 and 1872.

In River Street, from Blackstone Street and connected with sewer by a tie-off, three hundred fifty-four (354) feet have been laid. The department has removed the six inch pipe which has supplied this section since 1872.

In Rockwell Street, from Pleasant Street to River Street four hundred twenty two (422) feet of six inch pipe have been laid. The four inch pipe laid in 1868, has been removed.

In Union Street, from Magazine Street to Pleasant Street, the old four inch pipe, laid in 1867, has been replaced by five hundred thirty six (536) feet of six inch pipe.

In Warland Street, from Magazine Street to Pleasant Street, five hundred seven (507) feet of six inch pipe have been laid. The old four inch pipe, part of which was laid in 1867, and a part in 1872, has been removed.

The inspection and blowing off of all the main pipes in the City have been found to be of such benefit to the condition of the water that it now may be considered an annual necessity.

This Spring it was again made under the direction of a foreman in the department with good results.

In addition to this, during the season several cases of disturbed condition of water have been cared for separately by thoroughly blowing off the mains, whose conditions have been reported; in the majority of cases the sections where these complaints arise are supplied by pipes having dead ends.

As in former years, the department has responded to the requests of the Sewer and Street Departments, during their works of construction, and in each case where repairs have been made necessary by the building of new work, the cost of the same has been charged and met by the constructing department.

In Dinsmore Court the four-inch main pipe has been raised throughout its entire length.

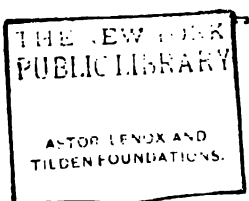
In Green Street, from Pleasant Street to Vernon Street, the old four-inch pipe has been removed in order to give its location to the Cambridge Sewer Department, which has constructed a sewer in the street. The old four-inch main was laid in the years 1869 and 1871.

In December, 1903, a connection was made between the twenty-four-inch mains and the supply main of the Metropolitan Water and Sewerage Board at the location in Cambridge Common opposite Holmes Place, where these pipes cross.

.See page 46 for a more extended account of the necessity for this connection.



40-inch Steel Male, Near Eyarweather Street



W. A. N. MILLER, D. L. LAYTON AND D. L. HARRISON

[illegible]

SUPPLIES.

The total number of supplies laid to date, November 30, 1904, is fourteen thousand eight hundred three (14,803).

See page 66 for recapitulation table of these supplies with pipe, valves, etc., furnished.

One hundred four (104) supplies were laid of galvanized pipe in sizes from three-fourth-inch to two-inch inclusive, and seven (7) supplies were of cast iron pipe and laid in the following locations:—

One four-inch for E. & R. Laundry on Massachusetts Avenue at Winsor Street.

One four-inch for A. H. Hews Company on Crescent Avenue.

One four-inch for Dr. Sargent's Gymnasium on Everett Street.

One four-inch for Asa C. Lamson on Main Street.

Two four-inch for Isaac McLean on Mount Auburn Street.

One six-inch (one thousand forty (1,040) feet in length) for Harvard University from Kirkland Street across the grounds to Massachusetts Avenue.

The total number of supplies laid during the year, *i. e.*, one hundred eleven (111) is the smallest annual number laid with one exception: in 1878 only one hundred two (102) supplies were laid during the year.

In 1891, ten years ago, there were four hundred thirteen (413) supplies laid

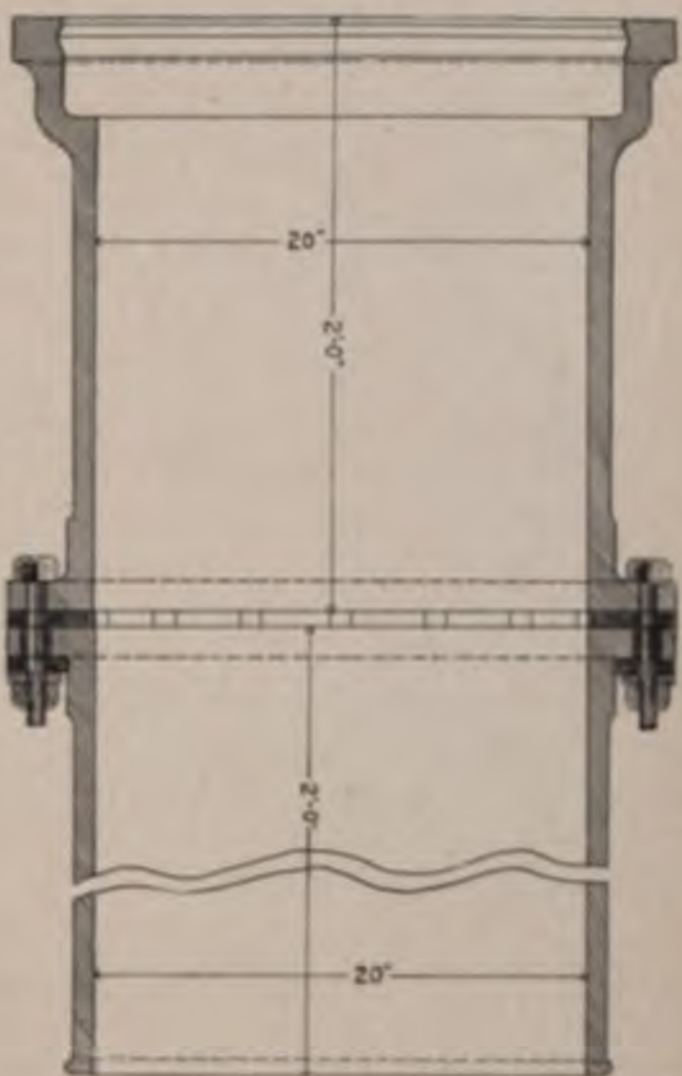
This exhibit shows the small amount of construction of new buildings that has been done during the year.

Thirty-nine (39) old supplies have been furnished with sidewalk shut off cocks and boxes.

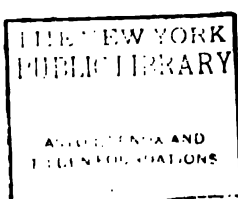
In Dinsmore Court, where the main pipes and supplies were too deep, the entire number of supplies, fourteen, (14) were renewed.

In Green Street, at Vernon Street, etc., four (4) old supplies formerly on the old four-inch main have been renewed in the street and connected to the twenty-inch main.

One hundred seventy-two (172) supplies have been renewed in cases where the original supplies were old, leaking or too small to supply the premises.



CAMBRIDGE WATER WORKS.
Gaskets and Tubing for Insulation Joints
1904.



Two supplies have been extended

For the use of the George G. Page Box Company, the four inch supply has been removed and a six inch laid in its location

In the following named streets, where the main pipes have been renewed, the supplies also have been renewed in the streets to the property lines, as follows:

Harvard Street	7	3 1/2 inch
	2	1 inch
Lake Street	6	3 1/2 inch
Park Street	13	3 1/2 inch
Perry Street	13	3 1/2 inch
River Street	6	3 1/2 inch
	1	1 inch
Rockwell Street	12	3 1/2 inch
Upton Street	15	3 1/2 inch
Warland Street	8	3 1/2 inch
	4	1 inch

87

Total number of supplies renewed during the year was two hundred and twenty eight (278)

Following is the list of establishments having fire protection from the City of Cambridge

American Rubber Co.,	Hinney Street,	Two 6 in
American Net & Twine Co.,	Third Street,	Two 6 in
American Net & Twine Co.,	Third Street,	6 in
American Vulcanized Fibre Co.,	Tannery Street,	2 in
Boston Asphalt Paving Co.,	First Street,	6 in
East State Metal Works,	Harvard Street,	6 in
Barnes & Shepard,	Chesham Street,	2 in
Beake & George F. Manufacturing Co.,	Hinney Street,	6 in
	Third Street,	6 in
Boston Beach Hauling Co.,	Mt. Auburn Street,	6 in & 6 in
Boston Elevated Railway Co.,	Haldwin Street,	2 in & 6 in
	Cambridge Street,	Two 2 in
	Peabody Street,	Three 6 in
	Massachusetts Avenue	6 in
	Mt. Auburn Street,	6 in & 2 in
	Murray Street,	6 in
	River Street,	6 in
Boston & Maine Railroad	Bridge Street,	6 in
	Bridge Street,	6 in
	East Street,	6 in
	Prison Court Street,	6 in

Boston Woven Hose & Rubber Co.,	Portland Street, . . .	8-in. & 10-in.
Cambridge Gas Light Co., . . .	Third Street, . . .	6-in.
Cambridge Electric Light Co., . . .	Western Avenue, . . .	6-in.
Cambridge Laundry,	Kinnaird Street, . . .	6-in.
Cambridge Mutual Fire Insurance Co.,	Massachusetts Avenue, . .	2-in.
Chelmsford Foundry Co.,	Portland Street, . . .	2-in.
Dover Stamping Co.,	Pleasant Street, . . .	6-in.
Fogarty & Daly,	Massachusetts Avenue, . .	4-in.
Ginn & Co.,	First Street, . . .	Two 6-in.
" "	Athenaeum Street, . . .	8-in.
Goepper Bros.,	Ninth Street, . . .	1-1-2-in.
Harvard University,	Harvard Union, Harvard St.,	4-in.
" "	Memorial Hall, Cambridge St.,	4-in.
" "	Observatory, Concord Ave.,	6-in.
" "	Semitic Mus'm, Divinity Ave.,	4-in.
Hews, A. H., Co.,	Crescent Avenue, . . .	Two 4-in.
Holy Ghost Hospital for Incurables,	Hovey Avenue, . . .	3-in.
Houghton, Mifflin & Co.,	Albro & Blackstone Streets,	6-in.
" " "	River Street, . . .	6-in.
Irving & Casson,	Otis Street, . . .	6-in.
" "	Thorndike Street, . . .	Two 6-in.
" "	Thorndike Street, . . .	2-in.
Ivers & Pond Piano Co.,	Albany Street, . . .	4-in. & 6-in.
Keeler & Co.,	Thorndike Street, . . .	1-in.
Kendall, Edward, & Sons,	Main Street, . . .	2-in.
Lamb & Ritchie,	Albany Street, . . .	6-in.
Lever Bros. Co.,	Broadway, . . .	6-in.
" " "	Broadway, . . .	8-in.
Little, Brown & Co.,	Putnam Avenue, . . .	6-in.
Lockhart, Wm. L., & Co.,	First Street, . . .	6-in.
Luke, E. H., Estate of,	Main Street, . . .	2-in.
Mason & Hamlin Co.,	Broadway, . . .	Two 6-in.
McLean, Isaac,	Mt. Auburn Street, . . .	4-in.
Metropolitan Storage Warehouse Co.,	Massachusetts Avenue, . .	6-in.
Middlesex C'ty, House of Correction,	Second & Spring Streets, .	6-in.
National Biscuit Co.,	Franklin Street, . . .	4-in.
" " "	Franklin Street, . . .	6-in.
" " "	Green Street, . . .	8-in.
National Linseed Oil Co.,	Fifth Street, . . .	6-in.
North Packing & Provision Co., . . .	Winsor Street, . . .	6-in.
O'Brien, John (Rev.),	Seventh Street, . . .	4-in.
Page, Geo. G., Box Co.,	Hampshire Street, . . .	Two 6-in.
Petterson, Oscar G.,	483 Main Street, . . .	4-in.
Pierce, Thomas, Trustees of Estate of,	Broadway, . . .	6-in. & 4-in.
Pi Eta Club,	Winthrop Street, . . .	2-in.
Porter, Henry S.,	Kinnaird Street, . . .	4-in.
Reardon, John, & Sons, Corporation,	Waverly Street, . . .	4-in.
Reardon, William,	Portland Street, . . .	2-in.
Revere Sugar Refinery,	Water Street, . . .	6-in.
Reversible Collar Co.,	Putnam Avenue, . . .	6-in.
Russell, Lucy J.,	29 Elm Street, . . .	1-1-2-in.
Rice, P. G., & Co.,	Massachusetts Ave. & Lee St.,	Two 2-in.
Sawyer, Howard M., & Son,	Thorndike Street, . . .	4-in.
" " "	Second Street, . . .	6-in.
Seavey Manufacturing Co.,	Third Street, . . .	6-in.
Seelye Manufacturing Co.,	First Street, . . .	4-in.

Cambridge Electrical Co.,	Auburn Street,	2in
" " "	Auburn Street,	6in
" " "	Franklin Street,	6in
Carson, Luther R.,	Broadway,	2in
Quarrier H. B. & Co.,	Hampshire Street,	6in
Quarrier & Allen, Sons & Co.,	Rogers Street,	6in
" " "	Sixth Street,	6in
Standard Oil Co.,	Fetter Street,	6in
Standard Turning Works,	Main Street,	2in
Thayer & Co., Heats,	Broadway,	6in
Tracy, Silvester & Son,	Broadway,	6in
Van der Veer & American,	London Street,	6in
" " "	Massachusetts Avenue,	6in
Van der Veer & Brown,	Nutting Place,	6in
Wheeler & Co.,	Claver's Hall, Mt. Auburn St.,	6in
W. A. Thomas Brothers,	Albany Street,	6in

DRINKING FOUNTAINS

The number of drinking fountains and troughs remains unchanged, at twenty-eight (28).

Of the above number, four (4) are of the Jenks manufacture and are water drinking fountains. These were supplied with ice at an expense to the Water Department, from June 25th to October 17th, inclusive, as follows:

Central Square fountain	\$112.50
East Cambridge fountain	145.50
Harvard Square fountain	105.00
North Cambridge fountain	96.75

\$459.75

Average cost per day of supplying ice 97 days for these fountains was per fountain, \$11.20.

In response to the calling the department's attention to acts of 1902 of the State Bureau of State Board of Agriculture, the fountains and troughs have been carefully watched and cleaned, in order, if possible, to suppress the contagion of the disease of glanders, which has been more or less prevalent in some sections of the State during the past year.

In the early part of the year the fountains, for a short time, were closed for this reason.

In all sections of the City the fountains have been painted and the minor repairs that were necessary were made.

STREET WATERING STANDPIPES.

Sixty-five (65) street watering standpipes are in use at this date, November 30, 1904.

There have been two additions made during the year, one at the corner of Norfolk and Washington Streets, and one on Erie Street, near Brookline Street.

At the corner of Broadway and Sixth Street a new standpipe has been set to replace one removed, which was broken by a team.

The Street Department, as in former years, has reimbursed this department for the expense incurred by repairs on these watering standpipes.

GATES.

Twenty-three (23) new gates have been set during the year (see recapitulation table on pages 66 and 67).

Nine (9) have been set on renewals of main pipe.

Four (4) have been set on new mains (extensions).

Nine (9) have been set on supplies.

One (1) has been set in place of broken, removed.

In nineteen (19) cases the gates have received repairs, made necessary by leaking, etc.

The annual inspection of gates has shown that they are in first-class condition.

Their locations have been carefully marked.

BOXES.

There have been eighty-one (81) boxes set during the year.

Seventeen (17) iron boxes, four (4) small wooden boxes, and one (1) hydrant box have been set on extensions and renewal of main pipes.

Fourteen (14) special boxes have been set on meters.

Eighteen (18) iron boxes have been set on supply work.

One (1) hydrant box, two (2) wooden boxes, and twenty-four (24) iron boxes have been set on worthless ones removed.

The gate boxes in all parts of the City have been inspected, and raised, lowered or repaired, as the change in grade of street has required. In cases where they have been affected by frost they have received the necessary care.

HYDRANTS.

There are one thousand eighteen (1,018) hydrants in use at this date,
November 30, 1904.

Hutton	156
Chapman	542
Coffin	41
Fluck	98
Hoycock	90
Perkins	91
	<hr/>
	1,018

Twenty-three (23) hydrants have been set during the year, and four
have been set in new locations, and nineteen (19) in place of old or broken
hydrants removed.

See page 57 for locations of this new work and changes.

Each hydrant has been removed from the following streets:

Boardway at Elm Street.

Boardway at Davis Street.

Cambridge Street at Harding Street.

Central Avenue at Madison Street.

East Street at Brookline Street.

Green Street at Vernon Street.

Hill Street at Bond.

Kearney Street at Quincy Street.

North Main Street.

North Main Street.

Magazine Street at Park Street.

Magazine Street at Upton Street.

Pleasant Street at Park Street.

Pleasant Street at Upton Street.

River Street.

Each hydrant has been removed from the following streets:

Bridge Street near Prison Point Street, Boston.

Cambridge Street at Madison Street, Boston.

North Street, Coffin.

Upland Road at Walnut Avenue, Boston.

Washington Avenue near Upland Road, Hingwood.

In the following named streets the hydrants have been repaired :—

Antrim Street.

Austin Street at Essex Street.

Banks Street at Mt. Auburn Street.

Blanche Street at Massachusetts Avenue.

Bow Street at Linden Street.

Brookline Street at Green Street.

Chestnut Street at Whitney Avenue.

Cambridge Street at Elm Street.

Distillhouse Street.

Hampshire Street at Amory Street.

Harvard Street at Main Street.

Harvard Street at Prospect Street.

Harvard Street at Winsor Street.

Kenwood Street at Putnam Avenue.

Leonard Avenue.

Mechanics Square.

Norris Street.

Scott Street.

Tannery Street.

Trowbridge Street.

Waterhouse Street.

In Van Norden Street the hydrant has been lowered to accomodate the Street Department.

In Concord Avenue the hydrant at corner of Madison Street has been relocated.

On the premises of the George G. Page Box Company the hydrant has been changed, at the expense of the company.

There have been three new post hydrants set in Harvard University grounds; these are the property of the University and at its expense were set by this department, when the work of laying the new six-inch supply main in the grounds was in process.

METERS.

During the year there have been three hundred sixty-three (363) meters set in locations not covered by meter at this time last year; their kind, sizes and numbers are found in the the table following :—

STONY BROOK PIPE LINE.

The only repair required on this line during the year has been one small leak at Arlington Street, Watertown.

The reading of the Venturi meter has been taken at frequent intervals and shows that the discharge from this main has been kept at least as high as it has been for some years past.

The gates at the Pond have been closed twice each day and the air removed from the pipe.

The air ejectors have been in constant operation.

STONY BROOK.

Two new cesspools have been constructed during this year.

One vault has been discontinued and one house has been connected with cesspool previously built, making twenty-three cesspools and eighteen vaults to be cared for.

A new set of screens has been made for the gate house which will add much to the facility of cleaning.

The stone work of the gate house should be thoroughly repointed and a new granolithic walk put down around the same this year.

HOBBS BROOK.

The water in this basin has not been down below grade 178.50 during the year and has continued to be of the best quality.

The standing grass not needed has been sold to the highest bidder.

The bushes and weeds along the highways around the basin have been cut and the grass on the dams kept mowed.

RECAPITULATION.

NEW SUPPLIES.

	6 Inch	4 Inch	2 Inch	1½ Inch	1¼ Inch	1 Inch	¾ Inch	Total
Length, in feet, of pipe.	1,040	289½	559½	39	337	502½	2,919	5,736½
Number of supplies.	1	6	8	1	7	14	74	111
Number of stop and waste valves.		4	6	1	7	13	74	105
Number of screw cocks.			6	1	9	14	73	103
Number of sidewalk cocks.					7	14	73	94
Number of service boxes.								94
Number of gates.	3	6						9
Number of gate boxes.								18

MAIN PIPE

	20 Inch	20 Inch	12 Inch	12 Inch	8 Inch	8 Inch	6 Inch	6 Inch	4 Inch	4 Inch	Total
Length in feet of pipe constructed	124	2	100		122	1,004	0	104	92		1,416
Length in feet of pipe reworked			0	0		2,777					2,777
Total length in feet of pipe	124	2	100	0	122	3,781	0	104	92		4,293
Number of joints		1				12		1			14
Number of 5 ft. lengths											14

TABLE SHOWING NUMBER OF GALLONS, BY THE MONTH, FLOWING OVER THE WATERWAY AT STONY BROOK BASIN.

	Gallons	Number of Days		Gallons	Number of Days
1900.			May	1,304,320,000	31
December	10,000,000	30	June	223,000,000	30
1901.			July	3,000,000	31
January	17,000,000	31	August		
February	17,000,000	29	September	60,000,000	30
March	1,700,000,000	31	October		
April	1,000,000,000	30	November	1,000,000	30
				3,781,320,000	365

Total amount wasted 3,781,320,000 gallons

Total number of days in which water wasted 365

HOBBS BROOK.			
STONY BROOK.		LINCOLN STREET. Basin No. 1.	
Lowest elevation during month.	Highest elevation during month.	Lowest elevation during month.	Highest elevation during month.
1903.			
Dec. 1	80.23	Dec. 9	180.70
Dec. 14	81.15	Dec. 31	181.10
1904.			
Jan. 13	80.08	Jan. 1	181.10
Jan. 24	81.19	Jan. 25	181.37
Feb. 14	81.02	Feb. 16	181.30
Feb. 23	81.48	Feb. 29	181.42
Mar. 3	81.29	Mar. 6	181.40
Mar. 9	82.29	Mar. 26	181.70
Apr. 27	81.40	Apr. 26	181.40
Apr. 29	83.04	Apr. 30	182.03
May 1	82.75	May 1	181.95
May 26	80.92	June 25	181.29
June 8	81.42	June 9	181.45
July 17	79.79	July 31	180.70
July 2	81.10	July 1	181.30
Aug. 27	79.98	Aug. 31	180.40
Aug. 5	80.75	Aug. 3	180.65
Sept. 29	79.81	Sept. 14	180.15
Sept. 16	81.46	Sept. 16	180.65
Oct. 26	79.98	Oct. 10	180.45
Oct. 2	80.33	Oct. 14	180.55
Nov. 9	80.00	Nov. 9	180.44
Nov. 17	81.04	Nov. 18	180.60
	81.14	Nov. 18	180.90
1903.			
Dec. 10	Set first flash-board.	Dec. 9	180.58
Dec. 31		Dec. 31	181.07
1904.			
Jan. 4	Removed first flash-board.	Jan. 1	181.07
Jan. 7	Set first flash-board.	Jan. 25	181.32
		Feb. 16	181.25
		Feb. 29	181.37
		Mar. 1	181.37
		Mar. 26	181.65
		Apr. 27	181.37
		Apr. 30	182.00
		May 27	181.33
		May 1	181.90
		June 25	181.15
		June 9	181.40
		July 31	180.55
		July 1	181.35
July 16	Removed first flash-board.		
July 23	Removed second flash-board.		
July 26	Removed third flash-board.		
July 30	Removed fourth flash-board.		
Aug. 23	Removed fifth flash-board.	Aug. 31	179.75
Aug. 27	Removed sixth flash-board.	Aug. 3	180.55
Aug. 27	Removed seventh flash-board.		
Sept. 4	Removed eighth flash-board.	Sept. 14	179.15
Sept. 5	Removed ninth flash-board.	Sept. 1	179.70
Sept. 10	Removed tenth flash-board.		
Sept. 15	Set tenth flash-board.		
Sept. 18	Set eighth flash-board.		
Sept. 18	Set seventh flash-board.		
Sept. 27	Removed seventh flash-board.		
Sept. 28	Removed eighth flash-board.		
Oct. 1	Set ninth and eighth flash-boards.	Oct. 31	178.95
Oct. 4	Removed eighth and ninth flash-boards.	Oct. 1	179.50
Oct. 7	Set tenth flash-board.		
Oct. 13	Set tenth flash-board.		
Oct. 17	Removed tenth flash-board.		
Oct. 21	Set tenth flash-board.		
Oct. 28	Removed tenth flash-board.		
Nov. 2	Removed eleventh flash-board.	Nov. 18	178.50
Nov. 5	Removed twelfth flash-board.	Nov. 1	178.92

HOBBS BROOK.

COMPARATIVE TRENCHING FOR THE LAST TEN YEARS

	Excavated	Removals	Supplies	Total Feet	M. cu.
1900	17,000	15,000	22,000	54,000	9.7
1901	17,000	15,000	22,000	54,000	11.55
1902	17,000	15,000	22,000	54,000	12.10
1903	17,000	15,000	22,000	54,000	9.71
1904	17,000	15,000	22,000	54,000	9.61
1905	17,000	15,000	22,000	54,000	9.11
1906	17,000	15,000	22,000	54,000	9.63
1907	17,000	15,000	22,000	54,000	9.23
1908	17,000	15,000	22,000	54,000	9.11
1909	17,000	15,000	22,000	54,000	9.08
1910	17,000	15,000	22,000	54,000	9.08

335514

SUMMARY OF STATISTICS

FOR THE YEAR ENDING NOVEMBER 30, 1904.

In form recommended by the New England Water Works Association

CAMBRIDGE WATER WORKS.

CITY OF CAMBRIDGE, COUNTY OF MIDDLESEX, STATE OF MASSACHUSETTS.

GENERAL STATISTICS.

Population by census of 1900 — 91,886.

Date of construction — 1855.

By whom owned — City of Cambridge.

Source of supply — Hobbs Brook and Stony Brook in Lincoln, Waltham and Weston, and Fresh Pond in Cambridge.

Mode of supply (whether gravity or pumping) — Gravity from Hobbs and Stony Brooks to Fresh Pond, pumping from Fresh Pond to Payson Park Reservoirs, thence by gravity to consumers.

PUMPING STATISTICS.

1. Builders of pumping machinery — One Leavitt built by Groshon High Duty Pumping Engine Company; two Worthington; one Blake.

2. Description of fuel used — *a.* Kind — bituminous.

b. Brand of coal — Cumberland and New River.

c. Price of coal per gross ton — delivered from December, 1903, to November 30, 1904, \$4.20.

3*a.* Coal consumed for the year — 3,650,513 lbs.

3*b.* Coal consumed for pumping purposes only — 3,601,040 lbs.

4. (Pounds of wood consumed) \div 3 = equivalent amount of coal, 500 lbs.

5. Total equivalent coal consumed for the year = (3*b*) + (4), 3,601,540 lbs.

SUMMARY OF STATISTICS

71

	Gallons
6a Total pumpage for the year without allowance for slip	2,831,342,145
6c Total amount purchased from Metropolitan Water and Sewerage Board	319,640,000
6e Total consumption for the year	3,210,982,145
7 Average static head against which pumps work	158.03 feet
8 Average dynamic head against which pumps work	194.44 feet
9 Number of gallons pumped per pound of equivalent coal	1.96
10a Millions pumped 1910-11 100 tons cost 1910	1,907,424
10b Total fuel consumed 1910-11 100 tons	

Cost of pumping, figured on pumping station expenses, viz \$17.208.10

11 Per million gallons pumped \$6.11

12 Per million gallons raised one foot dynamic 0.31

13 The City engine were run 11 hours during year

FINANCIAL STATISTICS FOR 1911

Operating receipts	\$1,210,000.00
Operating expenses	3,424,830.02
Amortments	3,017.88
Construction account	2,000.00
	\$8,232,828.07

EXPENDITURES

For Maintenance		Operating Expenses
General expenses	\$21,625.92	\$21,625.92
Supplies expense	29,377.58	
Salaries	9,463.50	9,463.50
Salaries, pumping	7,089.25	7,089.25
Pumping, general	10,508.94	10,508.94
French Park Reservoir	784.33	784.33
French Pond Reservoir, general	9,076.93	9,076.93
French Pond Reservoir, grading	12,500.00	
Hudson Brook Reservoir	1,468.64	1,468.64
On water raised forward,	\$70,185.09	\$70,185.09

SUMMARY OF STATISTICS.

<i>Amounts brought forward,</i>	\$79,185 09	\$56,380 58
Stony Brook Reservoir	2,999 96	2,999 96
Ice for fountains	460 35	
Rent	1,200 00	1,200 00
Metropolitan water	14,000 00	
	<u>\$97,845 40</u>	<u>\$60,580 54</u>
Interest on bonds	126,126 50	
	<u>\$223,971 90</u>	
Sinking Fund	121,522 50	
	<u>\$345,494 40</u>	
Refunds and abatements	7,291 63	
	<u>\$352,786 03</u>	
(Transferred to Construction account, \$7,059.28.)		
<i>Construction :</i>		
General	\$13,600 99	
Hobbs Brook land	221 00	
Hobbs Brook, general	76 84	
City Solicitor	500 00	
Stony Brook Main	3,454 03	
Meters	3,999 12	
	<u>21,851 98</u>	
		<u>\$374,638 01</u>
Net cost of works to date	\$5,772,507 13	
Bonded debt at date	3,350,600 00	
Value of Sinking Fund at date	1,218,686 74	
Average rate of interest	3½ and 4 per cent.	

STATISTICS OF CONSUMPTION OF WATER.

1. Estimated total population at date — 97,826.
2. Estimated population on lines of pipe — 97,826.
3. Estimated population supplied — 97,826.

SUMMARY OF STATISTICS

73

4. Total pumping for year = 2,831,342,145 gallons
5. Water purchased from Metropolitan Water and Sewerage Board = 37,660,000 gallons
6. Total consumption for the year = 3,210,982,145 gallons
7. Passed through meters = 1,143,795,800 gallons
8. Percentage of consumption meters = 35.6 per cent
9. Average daily consumption = 8,773,175 gallons
10. Gallons per day to each inhabitant = 89.68
11. Gallons per day to each consumer = 89.68
12. Gallons per day to each tap, 593
13. Cost of supplying water, per million gallons pumped, figured on total maintenance operating expenses, \$21.39
14. Total cost of supplying water, per million gallons pumped, figured on total maintenance + interest on bonds, \$65.95

STATISTICS RELATING TO DISTRIBUTION SYSTEM

MAINS

- Kind of pipe — cast iron
- Size — From 2 inch to 40 inch
- Extended — 1,411½ feet during year
- Retained — 3,763 feet during year
- Total now in use — 125.62 miles
- Number of leaks per mile — 17
- Length of pipes 2 and 3 inches diameter — 2 miles
- Number of hydrants added during year — public — 13
- Number of hydrants — public now in use — 1,018
- Number of stop gates added during year — 23
- Number of stop gates smaller than 8 inch — none
- Range of pressure on mains — 45 lbs. to 55 lbs.

BRANCHES

- Kind of pipe — galvanized iron
- Size — Three-fourth inch to two inches of galvanized pipe — 5 inch to 24 inch and 3 inch of cast iron pipe
- Extended — 5,734½ feet
- Estimated total now in use — 115.16 miles

SUMMARY OF STATISTICS.

Number of service taps added during year — 111.

Number now in use — 14,803.

Average length of service — 43 feet (for the year).

Average cost of service for the year — 17.69.

Number of meters added — 363.

Number now in use — 2,596.

Percentage of services metered — 17 %.

Respectfully submitted,

EDWIN C. BROOKS,
Superintendent.

The following statement is from the report of the Commissioners of the Sinking Fund of the City of Cambridge, and shows the present condition of the Water Loan Sinking Fund

On

The amount of the Fund November 30, 1903, was	\$1,002,071 00
The amount received from the City Treasury of Cambridge being the annual requirements for 1904 derived from Water Rates was	171,327 30
Interest received on invested funds	20,737 27
Premium received on bond purchased for investment	200 00
	\$1,223,335 27

On

Paid accrued interest on investments purchased	\$2,107 00
Paid premiums on investments purchased	2,361 70
Leaving the amount of the fund November 30, 1904	1,218,866 57
	\$1,223,335 27

The totaled Water Debt, which the foregoing Fund is to pay, amounts as follows:

Nov. 1, 1890	\$1 25	\$61,000 00
Oct. 1, 1891	do	50,000 00
Nov. 1, 1892	do	22,000 00
July 1, 1893	do	60,000 00
Aug. 1, 1894	do	25,000 00
June 1, 1895	do	20,000 00
May 1, 1896	do	20,000 00
June 1, 1897	do	25,000 00
Sept. 1, 1898	do	125,000 00
Jan. 1, 1899	do	20,000 00
Oct. 1, 1900	do	25,000 00
Jan. 1, 1901	do	150,000 00
Mar. 1, 1902	do	25,000 00
Nov. 1, 1903	do	65,000 00
Feb. 1, 1904	do	100,000 00
Aug. 1, 1905	do	20,000 00
Apr. 1, 1906	do	200,000 00
Aug. 1, 1907	do	200,000 00
Apr. 1, 1908	do	100,000 00
July 1, 1909	do	200,000 00
Aug. 1, 1910	do	100,000 00
Oct. 1, 1911	do	200,000 00
Sept. 1, 1912	\$1 25	200,000 00
July 1, 1913	\$1 25	100,000 00
Nov. 1, 1914	\$1 25	25,000 00
Amount required for same		\$2,600,000 00

COMMISSIONERS OF SINKING FUNDS.

Amount brought forward \$2,649,100 00

Dec. 1, 1917	.	.	.	.	3 1-2s	.	.	.	.	140,000 00
May 2, 1918	.	.	.	.	3 1-2s	.	.	.	.	50,000 00
June 1, 1918	.	.	.	.	3 1-2s	.	.	.	.	60,000 50
Nov. 1, 1918	.	.	.	.	3 1-2s	.	.	.	.	50,000 00
Nov. 1, 1919	.	.	.	.	3 1-2s	.	.	.	.	23,000 00
Nov. 1, 1920	.	.	.	.	3 1-2s	.	.	.	.	30,000 00
July 1, 1921	.	.	.	.	3 1-2s	.	.	.	.	30,000 00
July 1, 1922	3 1-2s	13,500 00
Nov. 1, 1922	3 1-2s	5,000 00
April 1, 1924	4s	300,000 00

\$3,380,600 00



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JAN 31 1906

Annual Report

173072

OF



THE WATER BOARD



1905

City of Cambridge

MASSACHUSETTS







City of Cambridge
Massachusetts

ANNUAL REPORT

OF THE

WATER BOARD

FOR THE

YEAR ENDING NOVEMBER 30, 1905



PRINTED FOR THE DEPARTMENT

173072



CAMBRIDGE WATER BOARD

1906

President

WILLIAM B. DURANT

Members of the Board

GEORGE H. HOWARD	Term expires 1905
WILLIAM B. DURANT	Term expires 1906
ANDREW J. RADY	Term expires 1907
JOHN F. O'BRIEN	Term expires 1908
EDMUND H. STEVENS	Term expires 1909

WALTER H. HARDING, Clerk

Superintendent of Works

EDWIN C. BROOKS

Water Registrar

WALTER H. HARDING

CAMBRIDGE WATER BOARD

Date of election and length of service of members, 1863-1905.

CHESTER W. KINGSLEY	1865-1894	
JOHN SARGENT	1865-1871	
A. K. P. WELCH	1865-1871	
ROBERT DOUGLASS	1865-1871	
SAMUEL SLOCOMB	1865-1876	
Z. L. RAYMOND	1871	
HENRY L. EUSTIS	1871-1885	
J. WARREN MERRILL	1871-1881	
GEORGE P. CARTER	1871-1883	
JOHN H. LEIGHTON	1876-1879	
KNOWLTON S. CHAFFEE	1879-1889	
JAMES M. W. HALL	1881-1899	
LEANDER M. HANNUM	{ 1883-1884 1885-1893	
JOHN F. O'BRIEN	1884-1895	
GEORGE H. HOWARD	1889-	(Now in Office.)
E. BURT PHILLIPS	1893-1896	
FRANK A. ALLEN	1895-1899	
STILLMAN F. KELLEY	1894-1903	
WELLINGTON FILLMORE	1896-1903	
EDMUND H. STEVENS	1899-	(Now in Office.)
WILLIAM B. DURANT	1899-	(Now in Office.)
ANDREW J. RADY	1903-	(Now in Office.)
JOHN F. O'BRIEN	1903-	(Now in Office.)

Presidents of the Board

J. WARREN MERRILL	1865-1867
EZRA PARMENTER	1867
JOHN SARGENT	1867-1871
J. WARREN MERRILL	1871-1873
CHESTER W. KINGSLEY	1873-1876
GEORGE P. CARTER	1876-1883
CHESTER W. KINGSLEY	1883-1894
JAMES M. W. HALL	1894-1899
WILLIAM B. DURANT	1899-

1927



View at Fresh Pond Park

REPORT OF THE CAMBRIDGE WATER BOARD

December 19, 1905

To the Honorable, the City Council of the City of Cambridge

The forty-first annual report of the Cambridge Water Board, for the year ending November 30, 1905, is submitted for your consideration.

The different reservoirs, and other works under the charge of the Board, are in better condition than they were one year ago, inasmuch as a section of the new pipe line has been successfully constructed, and good progress has been made in the improvement of Kingsley Park. Much, however, remains to be done, if needed improvements are to be carried out.

The water supplied to the water takers is still of good quality, and compares favorably with the average surface waters supplied to other municipalities of the Commonwealth.

We regret to report that the pending suit of John C. Gray and others against the City of Cambridge has been decided by the Supreme Judicial Court in favor of the plaintiffs. This was a bill praying for an injunction against the continued use by the City of a portion of its distribution pipes which originally supplied water to the old reservoir on Highland Street, and extend across private land now owned or controlled by the plaintiffs. These pipes were laid under grants in deeds from the former proprietors of the soil, made many years ago, the earliest dated May 3, 1856, and in those deeds the exact interest thereby conveyed in the land in question was left a matter of some doubt, but it was therein stated in substance that the purpose of the grant was to conduct water from Fresh Pond to the Reservoir, and the contention of the plaintiffs was that the Reservoir having been removed and the site sold, the rights conveyed by the deeds expired or reverted to the owners of the soil, although for more than twenty years water had not only been conducted to the Reservoir, but distributed through the same pipes to different parts of the City. The contention was finally sustained by the full bench of the Supreme

Judicial Court, and consequently the City will be obliged to discontinue the use of the pipes. This will involve the laying of new pipes in Huron Avenue and Reservoir Street at an expense of about \$12,000.

TUNNELS UNDER BROAD CANAL AT FIRST, THIRD AND SIXTH STREETS.

The pipes under Broad Canal at First, Third and Sixth Streets are now smaller than is desirable and have been broken several times by vessels passing over them, and by dredgers.

By the terms of the Charles River Dam Act, these pipes are to be lowered by the Charles River Dam Commission. In view of the injury by electrolysis to submerged water pipes, and owing to the desirability of getting at the pipes at any time for repairs, and as a matter of safety, it would seem very desirable that these pipes should be enclosed in tunnels under the canal. This is the recent practice in nearly, if not all, the cities.

The Gas Company is anxious to co-operate with the Water Department in the construction and use of these tunnels, and we would recommend that early action be taken in this matter.

The total cost of these tunnels at the three points has been estimated at about \$17,000; part of this, nearly \$5,000, would be borne by the Charles River Dam Commission, and nearly if not quite an equal amount by the Gas Company, leaving probably less than \$7,000 to be borne by the City.

FINANCIAL STATEMENT IN BRIEF.

The total cost of the Water Works to November 30, 1904, was . . .	\$5,772,507 13
There was expended during the year on Construction Account . . .	251,232 57
So that the total cost to November 30, 1905, was	\$6,023,739 70
The Construction Account for the year 1904, was	\$21,851 98
An increase of	229,380 59
	<u>\$251,232 57</u>

This increase is, of course, mainly due to the construction of a section of the new pipe line.

WATER BOND ACCOUNT.

The whole number of bonds outstanding is	\$3,646,600 00
Deducting from this sum the present value of the Water Debt Sinking Fund, exclusive of the note of the City for \$200,000 . . .	1,382,828 84
Leaves as the net Water Debt	<u>\$2,263,771 16</u>

For further details of the financial condition of the Department, the City Council is referred to the statement of the Registrar appended to this report. From that statement it appears that the excess of expenditures over receipts during the past year is the sum of \$6,476.93. This deficit was caused by the purchase of water from the Metropolitan Water and Sewerage Board, on two different occasions, at a cost of \$28,438.30, the sum being charged to Water Works Maintenance Account, and met, except to the extent of this deficit which had to be carried over, by the proceeds of water rates. It is hoped that the deficit will be made up during the coming year. At all events, there can be no more deficit arising from a similar cause, as no more water can be purchased from the Metropolitan Board without a special act of the Legislature.

WATER BASINS

In Hobbs Brook Reservoir the water is about two feet below the dam, and at Stony Brook about six inches below, that is, they are both nearly full, and this, in view of the dryness of the season, is a subject of congratulation. Fresh Pond stands now at grade 12.90 feet, which is a gain of nearly one foot in height since the water was let on through the new pipe. When the Pond is full, it stands at grade 16.85 feet above the City base (which is twenty feet below the coping of the Dry Dock at Charlestown Navy Yard). It is expected that the Pond will be filled on or before May 1st, next.

NEW PIPE LINE

In April last the City Council made an appropriation of \$250,000, for the purpose of constructing a section of the new pipe line, to connect with the old thirty-inch iron pipe at Irving Street, Watertown, and from thence to conduct the water delivered from the thirty-inch pipe through a new conduit sixty-three inches in diameter to Fresh Pond. The iron pipe which conducted the water from Stony Brook Reservoir to Fresh Pond is about eight miles in length, is thirty-six inches in diameter from Stony Brook Reservoir for a distance of one mile, and then for the remaining seven miles is thirty inches in diameter. This pipe was laid in 1867 and has therefore been in service about eighteen years. It is now partially covered with tubercles on the inside, and the flow of water is very much retarded by the resulting friction. Moreover, there are several summits in the pipe which are above the hydraulic mean gradient line,

and these summits are between Irving Street and Fresh Pond, and as is well known, materially reduce the capacity of the pipe. The new pipe line from Irving Street to Fresh Pond eliminates for that distance all these sources of trouble. It is entirely constructed of concrete sixty-three inches in interior diameter, except for a short distance where the grade of the land required a different construction, and where iron pipe was used forty-two inches in diameter, and the grade is such that there is a continuous fall from Irving Street to Fresh Pond. Unless obstructed, the pipe can never be filled, and there being therefore no strain upon it, it was not necessary to fortify it with steel rods, except for a short distance where it runs under the Fitchburg Railroad track. The concrete is in the judgment of the engineers not only cheaper than iron, but much better. It cannot rust or become tuberculated, is free from electrolytic action and, may last for centuries. This use of concrete was adopted upon the unanimous recommendation of the consulting engineers employed by the Board. The work was done under the direction of Mr. Freeman C. Coffin, as Engineer-in-Chief, and Mr. Charles G. Craib as Superintendent of Construction, and the result was in every way satisfactory.

The work was begun about May 8th last and the section was finished and water was turned on, at the connection with the old main pipe at Irving Street, October 30, 1905. About six hundred laborers were employed upon the work, almost all citizens of Cambridge, the few exceptions being men required for special work and of special qualifications, such as could not be obtained in Cambridge.

The cost of the conduit to December 1, 1905, was \$226,337.47. From a point opposite Irving Street on Arsenal Street, the conduit was constructed in Arsenal Street to a point about opposite the Arsenal gates, and from thence across private land, following in the main, the general direction of the Fitchburg Railroad, and in many places very near it, to Fresh Pond. Under an authority of an act of the Legislature, the Board took by eminent domain for the purpose of the construction of the pipe, a strip of land twenty feet wide extending from Arsenal Street nearly to Fresh Pond. This taking resulted in causing damage to many different owners of the land, of whose claims some have been adjusted, but there are others remaining unsettled and the sum above named will be increased to some extent by the awards of damages that may be made by a jury or

by the sums agreed upon between the City and the owners. The Board, with the aid of the City Solicitor, are now endeavoring to make reasonable and proper settlements with the different owners, and it is believed that little or no actual litigation will result from the various takings.

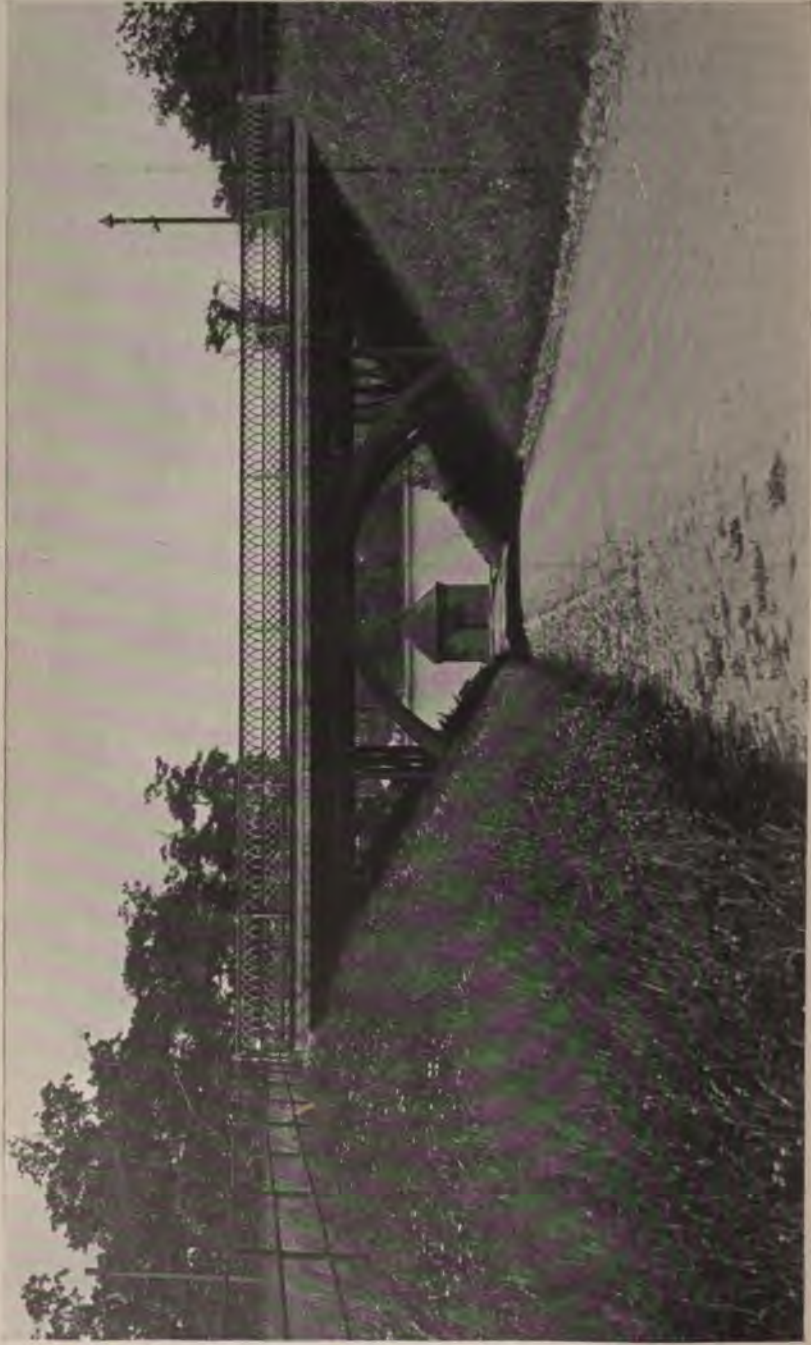
The length of the new section is a little over two miles. Shortly after the water was let on, readings were taken from a Venturi meter placed above the point of junction of the new and the old pipe, which showed that the new pipe was delivering over nine million gallons per day, as compared with a delivery of about six millions through the old pipe. Consequently the conduit has proved an entire success, and with the aid of the yield of the Pond itself will give a supply of at least ten million gallons per day, and probably more, which will suffice to meet the daily average consumption, now about nine million gallons, for some time, possibly for several years. It may be the part of wisdom, however, in view of the yearly increase in consumption of water, which is shown in the tables to be found in the Superintendent's report, hereto annexed, to proceed this year to construct another section of the pipe, so that adequate provision may be made for the future. The next section to be built would be either a pipe line extending from Hobbs Brook Reservoir to Newton Street in Waltham, and there connecting with the original thirty-inch pipe line, or a line extending from Irving Street, Watertown to Newton Street, Waltham, and there connecting with the thirty-inch pipe. There are several arguments in favor of the first alternative. In the first place, this line would add an additional head of 100 feet, the difference in height between the surface of Stony Brook Reservoir and that of Hobbs Brook Reservoir, and therefore yield a large quantity of water. In the second place the water of Hobbs Brook Reservoir is much purer and softer than that of Stony Brook Reservoir, and is nearly as excellent as spring water, and by supplying Fresh Pond with this water alone, the quality of the water in Fresh Pond would be greatly improved, although, as Hobbs Brook Reservoir unfortunately only holds about six months supply, it would be necessary to use Stony Brook water for a part of the year in any event. In the third place, if for any reason the water of Stony Brook should become contaminated by typhoid germs or otherwise, which is not, it is true, very probable, in view of the precautions constantly being taken by the Board, the water takers could for several months be

supplied with pure water from Hobbs Brook alone. For these reasons it might be wise for the City Council to authorize the building of this section next.

Much, however, (and perhaps more) is to be said in favor of extending the present concrete conduit of the same diameter, sixty-three inches, from Irving Street in Watertown to Newton Street in Waltham. This extension would much more largely increase the supply of water at less expense, although it would give no opportunity to separate the waters of the two reservoirs. It would be of cheaper construction than the section from Hobbs Brook, being entirely of concrete, it would be laid wholly or almost wholly in public streets, and hence there would be little or no damages; and there would be little or no rock excavation; whereas the line from Hobbs Brook must be made principally of cast-iron, there will be a large amount of rock to excavate and blast, and the line must go for the most part of its course across private land, involving large damages. Whichever of these two sections may be constructed first, the Board are of opinion that one of them should be built during the ensuing year. While, as above stated, it is *possible* that the section already built may supply the City for several years, it must be borne in mind that possibilities are not what the City needs, but certainties. Considering the rapid increase in consumption of water, and the constant growth in population, the Board are satisfied that the present margin of safety is altogether too small and that it would be dangerous to depend upon the supply furnished by the section of the pipe already built without further extensions.

CLEANING THE OLD PIPE LINE.

The Board are advised by the expert engineers, that it is probable that the tubercles, on the inside of the old pipe line can be removed at moderate cost, probably not exceeding \$10,000 by cutting into the pipe at different points and introducing a mechanical device heretofore successfully used in the cleaning of smaller pipes, which device is forced through the pipe by the pressure of the water, scraping off the tubercles as it passes. The Board have not been able to attempt this work heretofore, for the reason that they have not had enough water in Fresh Pond to make it safe to dispense with the use of the pipe for a sufficient length of time. Now, however, that it is anticipated that Fresh



Gate House over Old Stony Brook Conduit, at Fresh Pond

Pond will be entirely full on or before May 1st, next, the Board advise that an attempt to clean the pipe be made as soon as the Pond shall be full, as the storage in the Pond will then be sufficient to supply the City during the cleansing of the pipe, which it is estimated will take about a month, possibly a little longer. There would be less than six miles of pipe to clean, as it would not be expedient to clean that portion of the pipe between Irving Street and Fresh Pond which is at present disused. In making up the appropriations for the year, the Board will ask for a sum to be appropriated for this purpose. If the operation shall prove a success the flow of water will be largely increased, but the amount of the increase cannot easily be predicted. The result of the cleansing process may be known, however, before it is necessary to begin upon the actual construction of another section, provided there is water enough in Fresh Pond to begin the cleansing process sufficiently early in the Spring, and the result will have an important bearing upon the question of the immediate construction of another section of the new conduit. All necessary surveys and other preparations should be made, however, so that the work of construction of the new section could be begun in May, if then deemed necessary, or proper, as it probably will be.

FRESH POND PARK

The Board have continued the improvement of Kingsley Park, grading new surfaces and preparing them for planting in the Spring. They have expended on the work the sum of \$4,285.50 and will request an appropriation for the completion of the work. The Park and driveways around the Pond are the constant resort of citizens and visitors in need of fresh air and recreation, and it seems to the Board that a reasonable amount of money expended in making the borders of the Pond more beautiful and attractive is well spent, especially, if, as usual, it can be charged to maintenance account and paid out of surplus receipts.

STONY BROOK OVERFLOW

The overflow of Stony Brook for the year ending

November 30, 1905, was

3,148,901,000 gallons

For the year ending November 30, 1904, it was

3,726,899,000 "

Decrease

577,998,000 gallons

This decrease is readily accounted for by the unusual dryness of the season, the year 1905 being the dryest for over ten years. Unfortunately it is impossible to save any of this overflow, except so far as can be done by filling Fresh Pond to the brim when the water is overflowing the dam, and that can be done only by increasing the size of the pipe which leads to Stony Brook Dam. Some of it could be saved by constructing a new reservoir near the sources of the Brook, but it is believed that no new reservoir will be required for many years to come.

The annual rain-fall for the past ten years at Fresh Pond is as follows : —

Year.	Inches.
1896	38.82
1897	42.53
1898	52.42
1899	37.28
1900	46.89
1901	46.20
1902	43.31
1903	44.23
1904	42.89
1905	32.68
Average	42.72

The rain-fall for the year at Hobbs Brook Reservoir was 37.96 inches ; at Stony Brook, 38.40 inches.

The rainfall at Hobbs Brook in 1904 was 39.95 inches, showing a loss this year of 1.99 inches. The rain-fall at Stony Brook in 1904 was 41.18 inches, showing a loss of 2.78 inches.

CONSUMPTION OF WATER.

The total consumption of water for the year ending December 1, 1905, was	3,294,159,640 gallons
For the year ending December 1, 1904	3,210,982,145 "
Excess of consumption this year	83,177,495 gallons
The excess of consumption for the year ending December 1, 1904, over the year ending December 1, 1903, was	50,277,600 gallons
In 1895 the total consumption was	2,190,781,892 "
The consumption of the year 1905 being	3,294,159,640 "
and that of 1895	2,190,781,892 "
In ten years the consumption has increased	1,103,377,748 gallons
or about one-half.	

The excess of consumption this year is undoubtedly due in great part to the unusual amount of water used for manufacturing purposes, watering lawns, and for street watering, the last two causes due to the unusual dryness of the year.

METERS

The Board have caused to be set this year 346 meters, all upon application of water takers who prefer to pay for their water by meter, rather than to pay schedule rates. There are now in use 2,896 meters. The number of water supplies is 14,933, so that the proportion of metered supplies is only a little over one-fifth.

There is no doubt that a complete meter system would result in a great saving of water, and in the prolongation of the life of the water supply. The Board have frequently advocated the general use of meters, as may be seen by reference to their previous annual reports, but hitherto the City Council has not seen fit to make the necessary appropriations.

Mr Coffin in his report, annexed to the report of the Water Board for 1903, page 78, estimated the total saving which would be effected by the general use of meters from the year 1905 to 1924, at the sum of \$431,872.

Whatever may be the individual views of the members of the City Council, it would seem that all might concur in this, that the subject is at least worthy of thorough investigation and careful consideration.

The Board desire, in conclusion, to express their appreciation of the thorough and efficient manner in which the work of the construction of the new pipe line has been performed by the Chief Engineer, Mr Freeman C. Coffin, and his efficient Superintendent, Mr Crath. The work has not been delayed, but promptly finished in ample season and it has been done well. They also wish to acknowledge the valuable services of the City Engineer, Mr Hastings, who, with his assistants, had charge of the field work.

Attention is especially directed to the report of Mr Coffin, annexed to this report, where many details will be found which cannot be included in this report. Mr Coffin has been employed by the Board for two years,

and has made careful investigation and study of the Cambridge Water Works, and of the proper methods to develop their resources economically and to the best advantage.

Respectfully submitted,

WILLIAM B. DURANT,
GEORGE H. HOWARD,
JOHN F. O'BRIEN,
ANDREW J. RADY,
EDMUND H. STEVENS,

Cambridge Water Board.

**FINAL REPORT OF FREEMAN C. COFFIN UPON THE CON-
STRUCTION OF THE SIXTY-THREE-INCH CEMENT CON-
DUIT, FROM IRVING STREET, IN WATERTOWN, TO
FRESH POND, IN CAMBRIDGE**

Boston, December 19, 1905

To the Water Board of the City of Cambridge. -

GENTLEMEN: I submit the following final report upon the construction of the conduit from Irving Street, in Watertown, to Fresh Pond, in Cambridge.

The total length of this conduit from the point where it begins in Arsenal Street near Irving Street, in Watertown to the inlet to Fresh Pond is about 12,123 feet. About 11,500 feet are of concrete, five feet three inches in diameter inside. 475 feet are of forty-two-inch cast-iron pipe; thirty-four feet are taken up by the inlet chamber and well, and there are 117 feet of thirty-inch cast-iron pipe making the inlet to Fresh Pond.

The concrete section has a fall of three inches in 1,000 feet, except at one point, where there is a fall of two feet in ninety feet. The capacity of the concrete section was estimated at thirty million gallons in twenty-four hours. Actual measurements taken of the velocity of the water after completion indicate that its actual capacity, when running full, will be thirty-five millions or more.

The thirty and forty-two-inch cast-iron pipe sections have been given such a fall that their respective capacities are greater than that of the concrete section. The forty-two-inch pipe has a fall of two feet in its length of 475 feet. The thirty-inch pipe is so arranged that the water will rise in the well until there is a sufficient head over the surface of the water in Fresh Pond to discharge all of the water that comes to it. Thirty-five millions will require about three feet head, or the raising of the water in the well about three feet above the surface of the water in the Pond.

The conduit will no doubt become somewhat coated with vegetable matter from the water, which will reduce its carrying capacity somewhat.

It can, however, be easily cleaned and its original capacity restored. Drawings showing the plan and profile of the conduit and the details of its construction accompany this report.

Work was begun on the excavation of this conduit May 8, 1905, on Section No. 3 in private land belonging to the estate of Tyler Bigelow near Arsenal Street. The first concrete was laid in the conduit near the brook in the aforesaid land on May 16, 1905. The first piece of the conduit laid, twenty feet in length, was of the following dimensions: five feet and three inches inside diameter, six inches in thickness on the bottom, fifteen inches on the sides at the springing line of the arch and seven inches on top.

After this piece was laid, the forms were changed to make the sides thirteen inches thick instead of fifteen inches cross section. Since then no change has been made in the dimensions of the conduit and, with the exception of the first twenty feet, and a few places where there are special sections, it is as shown on the accompanying drawings throughout its length. The special sections are also shown on the drawings.

Owing to a mistake in setting grades, the conduit near the "Creamery" on Wheeler Court for about ninety feet in length was not laid to the true grade, being about four inches too high at the highest point. The bottom was cut out and repaved at the correct grade. The entire bottom of the conduit now corresponds with the true grade as shown upon the accompanying profile.

These, I believe, were the only changes in design or mistakes in construction made throughout the entire work.

The work was divided into six sections, upon which work was commenced in the following order: Section No. 3, Section No. 2, Section No. 4, Section No. 1, Section No. 5 and Section No. 6. This division is shown on the drawings.

There were four points on the line at which it seemed that the work could be done more economically in tunnel than in an open cut, one in Section No. 3, one in Section No. 4, one in Section No. 5 and one in Section No. 6. The total length of the work in tunnels was about 1,400 feet. Rock excavation was met with in a part of the tunnel in Section No. 5 under Mount Auburn Street. This was the only rock work encountered in the entire excavation.

In the tunnel in Section No. 3, about opposite the Head Rubber Works, the upper half of the conduit was constructed of brick masonry. All of the remainder of the conduit was entirely of concrete.

The concrete was formed by means of steel forms or centers. It was composed of one part Portland cement, two and one-half parts of sand and five parts of screened gravel. The brand of cement used was the Henslerberg, which proved very satisfactory. Tensile tests were made of samples from each carload with the following result:

Test test 24 hrs. at	of 410 lbs.	test, 372 lbs.	tensile strength
1 day	630	629	" " " "
25 "	630	607	" " " "
1 to 3 "	630	570	" " " "
25 "	630	579	" " " "
3 mos.	10	464	" " " "
6 "	3	431	" " " "

These tests were made by Mr. Nelson A. Hallett of No. 1 Ashburton Place, Boston.

The following are the quantities in this work:

47,914 cubic yards	excavation, average depth 14.25 feet.
3,330 "	tunnels
800 "	at inlet chamber
1,500 "	embankment.
9,650 "	concrete
45 "	brick work in tunnels
25 "	in houses over inlet chamber
490 feet	42 inch cast iron pipe
117 "	30-inch "
6 "	45 inch steel pipe at culvert
17 manholes	and covers

The total amount of cement used on the work was 11,613 barrels. This cement came in bags which were charged at the rate of 40 cents per barrel, or ten cents each, amounting in all to \$4,645.20. Credit was received for bags returned to the amount of \$4,529.02, or a loss on bags of \$116.18 due to lost and damaged bags. This amounts to practically one cent per barrel for the use of the bags. If wooden barrels had been used, the net cost would have been thirty cents per barrel. Very little cement was lost, certainly not equal to ten barrels perhaps so more than would have been lost in barrels. From \$3,700 to \$3,800 was saved by buying the cement in cotton rather than in wool. Out of the total

cement used it is estimated that from 75 to 100 barrels were used for laying brick, brushing and finishing surfaces, which leaves about 1.3 barrels per cubic yard as the average amount of cement used in the concrete, which, as before stated, was mixed in the proportion of one, two and one-half, and five.

The cost of the concrete in place as nearly as it can be estimated was as follows:—

.90 cubic yards gravel, at \$1 42	\$1 28
.45 " " sand, " 1 00	45
1.3 barrel cement, " 1 35	1 76
Cost of forms, \$4,233÷8,650 yards	49
Labor, including setting and cleaning forms	3 25
Cost per yard of concrete in place	<u>\$7 23</u>

The above cost does not include the cost of lumber, which was very small, the use of tools, general superintendence, inspection or engineering. On the other hand, it was based upon the cost of sand and gravel when bought from outside parties. Some of the sand and gravel used was taken from the trench and cost less than the above figure per yard for labor in screening and hauling.

The total amount paid out for sand and gravel was \$11,730, or about \$1.35 per yard, for all of the concrete laid instead of \$1.73, as given in the above estimate, which would indicate that, at the prices paid, the sand and gravel for 1,865 yards of concrete was found on the ground, or an amount which would have cost \$3,234 if bought from outside. How much it actually cost we do not know, except that it did not cost as much in any case as it would to buy it.

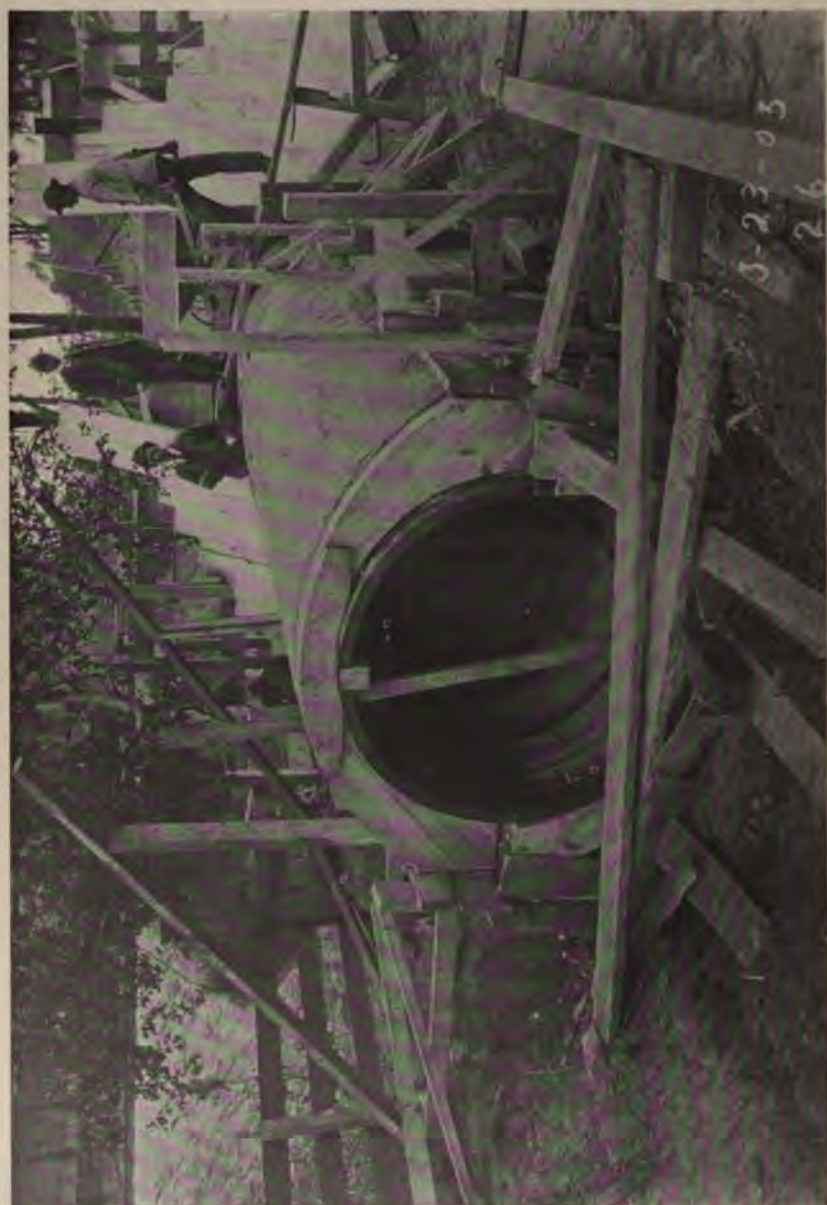
It should also be stated that the forms, which are of steel, are still on hand and available for further use, and will no doubt be capable of doing as much more work as they have already done, so that in case the conduit is extended the further use of the forms would materially decrease the cost of this item in the concrete.

COST OF SOME OF THE ITEMS THAT ENTER INTO THE WORK.

Lumber	\$10,798 91
Cement	15,648 74
Sand and gravel delivered on ground	11,729 58

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Portion of 63-Inch Concrete Conduit

Steel work, including forms for concrete, bulk plates, chutes, etc.		\$4,722 10
Cast iron pipe and special castings		5,097 16
Tools and machinery		5,722 93
Cost of machinery		4,147 10
Teaming		9,804 00
Labor on concrete	\$79,112 00	
Labor on all other work	84,778 04	
Wages	3,644 00	
Chief timekeepers, messengers, stockroom men, etc.	1,961 25	
Foremen	9,631 00	
Inspectors (not including Watertown inspectors)	2,420 00	
General superintendence including horse hire	2,744 00	
Total labor on pay roll less division engineers		150,793 29*
Engineering		7,170 00
Food B & M R. R., skilings, expense of crumpling, etc.		1,318 60
Food Town of Watertown for building sewers, rolling streets, furnishing water, etc.		3,778 15

* This was up to and including November 28th. A little work on brick house over last chamber has been done since then.

TABLE GIVING COST OF DIFFERENT ITEMS PER CUBIC YARD, PER LINEAL FOOT, AND AS AN APPROXIMATE PERCENTAGE OF THE TOTAL COST OF THE WORK

Item	Cost of Item	Cost per Cubic Yard		Cost per Lineal Foot	Approximate Percentage of Total Cost
		Concrete \$100	Excavation \$1,000		
Labor to open trench	\$4,722		\$4 11	\$4 37	
Labor to lay out	4,000		1 34	3 16	
Labor for concrete	79,112	79		79 1	
Tools removed	13,400			1 30	1 1
Cost for engines	500		0 10	0 04	0 04
Tools and machinery	5,722		0 05	0 01	0 01
Cost of machinery	4,147		0 04	0 01	0 01
Steel work and forms	4,222	4		0 01	0 01
Teaming	9,800		0 09	0 01	0 01
Labor on concrete	79,112	79 25		79 20	79 20
Labor on other work	84,778		1 02	0 07	0 07
Wages	3,644	3 64		0 00	0 00
Chief and timekeepers	1,961	1 96		0 01	0 01
Foremen	9,631	9 63		0 01	0 01
Inspectors	2,420	2 42		0 01	0 01
General superintendence	2,744	2 74		0 01	0 01
Engineering	7,170	7 17		0 01	0 01

Note: The foregoing table does not cover all of the expenses involved in the work, but only those which were readily capable of separation and analysis. The cost items and percentages are not exact, but close approximations to the exact figures. The division of labor cost is an approximate estimate, but the total labor cost is correct.

The work was completed ready for the water October 18, 1905, and the water was turned on for a test on that day. It was allowed to run

about sixty hours, when it was shut off and a careful inspection made of the inside of the conduit. It was found to be in perfect condition throughout its length. Water was finally and officially turned on at 2.15 P.M., November 2, 1905.

The following are the names of those comprising the organization of this work and who are responsible for its execution and success.

All of the field work of laying out the line and giving grades for the conduit was done under the direction of Mr. L. M. Hastings, the City Engineer, and by engineers from his office; Mr. Charles G. Craib, General Superintendent; Mr. A. E. Lyford and Mr. Seth Peterson, Division Engineers; Mr. James Grant, Mr. William Lindsay, Mr. William J. O. Brien, Mr. Charles Parker, Mr. Michael Rady, Mr. Henry A. Simonds and Mr. Joseph A. Wood, Foremen of Sections; Mr. John Craib, Foreman of Tunnel Work; Mr. E. W. Ellis, Mr. W. S. French, Mr. E. Grenier, Mr. Harry Joel, Mr. L. E. Kollock and Mr. F. Nesdell, Inspectors; Mr. E. J. Carroll, Inspector of Stock; Mr. J. O. Connell, Clerk and Inspector of Stock; Mr. Walter S. Hall, Timekeeper; Mr. Joseph A. Genest, Assistant Timekeeper.

PRESENT CAPACITY OF THE LINE FROM STONY BROOK DAM.

This section of the conduit was built (as part of a plan adopted by the Water Board for a line that would have a capacity to carry thirty million gallons per day from Stony Brook and Hobbs Brook Basin to Fresh Pond) to increase the flow through the present line from Stony Brook Dam by avoiding the summits on the lower end of that line and thus make available a greater head on a shorter line. The effective head on the old line was about thirty-four feet in 5,100 feet of thirty-six-inch pipe and 34,340 feet of thirty-inch pipe.

This was found by measurement to give a discharge of 5,750,000 gallons per day into Fresh Pond. By shutting gates and expelling the air from the summits this could be increased to over 6,000,000 gallons per day. This was explained in my report of December 1st, 1903. Since then the gate has been shut twice each day instead of once a day before. Either this or some other cause has increased the flow slightly, and it has averaged for the past year about six and one-half million gallons.

The following table shows the flow as measured by the Venturi meter, and read about once a month for the past two years.

FLOW OF WATER THROUGH 41 PIPE FROM STONY BROOK TO FRESH POND

DATE	FLOW THROUGH CAST IRON PIPE	DATE	FLOW THROUGH CAST IRON PIPE
September 5, 1925	4,325,000	January 19, 1926	4,355,000
September 11, 1925	4,400,000	February 12, 1926	4,425,000
September 19, 1925	4,361,000	March 11, 1926	4,464,000
September 25, 1925	4,371,000	March 17, 1926	4,370,000
Oct. 7, 1925	4,470,000	March 21, 1926	4,441,000
Oct. 14, 1925	4,445,000	April 7, 1926	4,420,000
Oct. 14, 1925	4,407,000	May 19, 1926	4,370,000
Oct. 21, 1925	4,387,000	June 20, 1926	4,375,000
October 27, 1925	4,445,000	July 27, 1926	4,340,000
November 11, 1925	4,470,000	August 22, 1926	4,410,000
November 15, 1925	4,450,000	October 11, 1926	4,160,000
November 24, 1925	4,400,000	October 29, 1926	4,340,000
December 14, 1925	4,192,000		

The building of the new conduit from Fresh Pond to Irving Street, a distance of 12,125 feet, results in securing an effective head of 46 feet in 3,100 feet of thirty six inch and 22,740 feet of thirty inch pipe. It was estimated in advance of the building of this conduit that it would increase the flow to 9,000,000 gallons per day. When the water was turned on November 2nd, the flow was 9,000,000 gallons. On December 5th it was 9,100,000 gallons. It may be that the increased velocity has scoured the pipes somewhat and has slightly increased the flow.

To this flow of water through the pipe line should be added the yield of Fresh Pond and its watershed to find the total available supply. The natural yield of this Pond in a year of average rainfall is about 2,000,000 gallons per day. In the driest period, of which we have the record of yield, about 1,650,000 gallons per day would have been furnished by drawing the Pond as low as it was drawn last year. If the surface flow on this watershed is taken off by sewers to a certain extent, the yield would be diminished by this amount. It is probable that there is now available from 10,000,000 to 11,000,000 gallons per day. The average consumption of 1925 was 9,000,000 gallons per day.

For 33 days after the water was let into the new conduit the consumption was 8,114,442 gallons per day, or a total of 267,923,106 gallons. During the same time the water in the Pond rose 11.14 inches, a gain of about 44.5 millions, or a total yield of 316.4 million gallons. The pipe line was delivering about 9.05 millions per day on the average, or a total

in the 33 days of 298.6 millions, leaving 17.8 millions or about 540,000 gallons per day as the yield of the watershed. This was during a very dry time. It is evident that with a rise in the Pond of 10 inches in a month like November of this year it is sure to be filled (about 4 feet more) on or before May 1, 1906, even with the probable increased consumption of the colder months.

As the new conduit has a carrying capacity of from 30 to 35 million gallons per day when running full, it is evident that the available capacity of the line is controlled by the capacity of the iron pipe line from the end of the conduit to Stony Brook Dam. This capacity is now, as already stated and as measured by the meter, 9 or 9.1 million gallons per day. With this amount of water the flow in the new conduit is 1.75 feet in depth above the invert, that is, the channel is filled to about 29 per cent. of its area.

I believe that the capacity of the cast-iron pipe line can be increased by cleaning it or scraping the tubercles from its inner surface. There is no doubt that the flow will be increased by such cleaning. There is little or no data upon which to make an estimate of the probable increase. The present flow is 9.1 million gallons. The flow after cleaning can hardly exceed 12 million gallons, and may, of course, be much less. I believe it to be very desirable to clean the pipe and secure all of the increase possible unless a further section of the proposed conduit is to be laid within a year or two. It would then be unnecessary to clean the present pipe.

The plan adopted by the Water Board included the building of four sections as required, and in the following order:—

SECTION No. 1. From Hobbs Brook Dam to connect with the present cast-iron pipe at Newton Street, in Waltham. This section, it was estimated, would increase the flow to 9,750,000 gallons daily.

SECTION No. 2. From Irving Street to Fresh Pond. This section, if built in this order, would increase the flow to 11,750,000 gallons per day.

SECTION No. 3. From Newton Street to Irving Street. This section, if built in this order, would increase the available capacity to 17,000,000 gallons daily.

SECTION No. 4. From Newton Street parallel with present pipe to



Tunnel for 63-inch Concrete Conduit

the junction of the thirty-inch and thirty-six inch pipes. This section would increase the capacity to 30,000,000 gallons per day.

It was finally decided (wisely, as I believe) to construct Section No. 2 first. This has been done with the result given above. When the time shall arrive for continuing this work, it will be necessary to determine which section shall be built next, whether No. 1 or No. 3 of the plan adopted. It seems proper at this time to make a statement of the results to be expected from either course.

If Section No. 1 is built next, the capacity will be increased from 9,000,000 to 11,750,000. This section will provide for taking a part of the water from Hobbs Brook Basin directly, or without passing through Stony Brook Basin. The disadvantage of this arrangement, if it is a disadvantage, is that it requires careful observation of the water in the two basins, and a change of use from one to the other at proper times in order to secure the maximum capacity of the line. The advantage of the plan is that, if for any reason it should be desirable to discontinue the use of water from either Hobbs Brook or Stony Brook Basin for a time, it could be done for as long as there was water in the other.

This would be desirable in the case of an epidemic of water borne disease upon one of the watersheds which did not occur at the same time upon the other. This may, of course, be a state of things that will never occur.

If Section No. 3 is built next, it will increase the capacity of the line to 14 million gallons. The advantage of this plan is in its greater capacity, giving a flow of 14 million gallons instead of 11.75 millions, and the simplicity of operation. With the yield of Fresh Pond, the total available supply will be over 18 million gallons per day, or nearly, if not quite, as much as the watersheds can be developed to supply.

In none of the foregoing figures has the effect of cleaning the present pipe been included. This, if done, would increase each one over the figure given about two million gallons per day.

Careful surveys and borings have not been made of the line of Section No. 3, and, therefore, no reliable estimates of cost. It is probably safe to say that its cost will be rather less than that of Section No. 1.

Respectfully submitted,

FREEMAN C. COFFIN

REPORT OF THE WATER REGISTRAR

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 1, 1905.

To the Cambridge Water Board:—

GENTLEMEN:— In compliance with the requirements of the City Ordinance I present the forty-first annual report of the operations of this Department showing the receipts, expenditures and abatements, together with a statement of the number of water takers, etc., for the year ending November 30, 1905.

Amount of bills remaining unpaid November 30, 1904:—

Water rates	\$5,410 37
Supplies and repairs	778 18
Off and on	150 00
Seals	8 50
Maintenance account	602 62
Construction account	156 26

Amount of bills placed in hands of City
Treasurer for collection from November 30, 1904,
to November 30, 1905:—

Water rates	\$351,399 53
Supplies and repairs	4,024 61
Off and on	529 00
Rents	168 00
Seals	88 75
Maintenance account	2,916 16
Construction account	1,271 99
Total bills	<u>\$367,503 97</u>

There has been collected:—

Water rates	\$345,795 07
Supplies and repairs	3,585 81
Off and on	499 00
Rents	160 00
Seals	91 25
Maintenance account	1,081 44
Construction account	800 29

1. 2



Payson Park Reservoir, showing Division Wall

WATER REGISTRY.

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There has been abated . . .

Water rates, off and on, and seals, supplies and repairs, and Construction account	\$3,065 20
---	------------

There remains uncollected

Water rates	8,166 20
Supplies and repairs	1,210 34
Off and on	164 00
Seals	1 75
Maintenance account	2,437 34
Construction account	637 94
Rest	8 00
	<u> </u> \$367,508 97

	EXPENDITURE	
Construction account	\$231,232 37	
Maintenance account	103,043 40	
	<u> </u> \$334,276 37	

ABATEMENTS.

Water rates, and supply and repair bills to the amount of	\$3,065 20
---	------------

	RECEIPTS	
Water rates to the amount of	\$1,979 07	
Which amount deducted from receipts	348,796 07	
Leaves net receipts for water	\$346,816 00	
Add off and on, seals, rents, seals and Maintenance account	1,831 00	
Makes net receipts of rates, seals, etc.	<u> </u> \$348,647 00	

OFF AND ON

Water has been shut off for non-payment of rates, or per order on account of vacancy, and seals have been applied to fixtures by request of owners, as follows

Water shut off in 1905	361
Supplies let on, shut off in 1905	600
Supplies let on, shut off in previous years	110
New supplies let on	111
Seal locks applied to fixtures in 1905	361
Seal locks removed put on in 1905	347
Seal locks removed, put on in previous years	264

Statement of yearly revenue received from water rates since the purchase of the works by the City

From April 30, 1865, to December 1 1865	\$20,347 19
From December 1, 1865 to December 1 1866	60,073 27
From December 1, 1866, to December 1, 1867	13,723 02

From December 1, 1867, to December 1, 1868	.	.	.	.	.	\$63,747 42
From December 1, 1868, to December 1, 1869	.	.	.	.	.	76,149 30
From December 1, 1869, to December 1, 1870	.	.	.	.	.	92,605 95
From December 1, 1870, to December 1, 1871	.	.	.	.	.	111,782 65
From December 1, 1871, to December 1, 1872	.	.	.	.	.	127,201 30
From December 1, 1872, to December 1, 1873	.	.	.	.	.	146,117 32
From December 1, 1873, to December 1, 1874	.	.	.	.	.	153,634 27
From December 1, 1874, to December 1, 1875	.	.	.	.	.	138,880 37
From December 1, 1875, to December 1, 1876	.	.	.	.	.	179,166 76
From December 1, 1876, to December 1, 1877	.	.	.	.	.	154,843 59
From December 1, 1877, to December 1, 1878	.	.	.	.	.	157,443 91
From December 1, 1878, to December 1, 1879	.	.	.	.	.	164,681 90
From December 1, 1879, to December 1, 1880	.	.	.	.	.	173,325 49
From December 1, 1880, to December 1, 1881	.	.	.	.	.	170,062 73
From December 1, 1881, to December 1, 1882	.	.	.	.	.	177,430 80
From December 1, 1882, to December 1, 1883	.	.	.	.	.	179,361 89
From December 1, 1883, to December 1, 1884	.	.	.	.	.	161,526 27
From December 1, 1884, to December 1, 1885	.	.	.	.	.	185,544 36
From December 1, 1885, to December 1, 1886	.	.	.	.	.	199,404 43
From December 1, 1886, to December 1, 1887	.	.	.	.	.	204,748 64
From December 1, 1887, to December 1, 1888	.	.	.	.	.	211,156 27
From December 1, 1888, to December 1, 1889	.	.	.	.	.	221,124 70
From December 1, 1889, to December 1, 1890	.	.	.	.	.	231,116 32
From December 1, 1890, to December 1, 1891	.	.	.	.	.	227,064 53
From December 1, 1891, to December 1, 1892	.	.	.	.	.	237,527 08
From December 1, 1892, to December 1, 1893	.	.	.	.	.	242,219 78
From December 1, 1893, to December 1, 1894	.	.	.	.	.	250,032 71
From December 1, 1894, to December 1, 1895	.	.	.	.	.	268,813 62
From December 1, 1895, to December 1, 1896	.	.	.	.	.	281,030 00
From December 1, 1896, to December 1, 1897	.	.	.	.	.	291,457 62
From December 1, 1897, to December 1, 1898	.	.	.	.	.	297,129 78
From December 1, 1898, to December 1, 1899	.	.	.	.	.	302,569 00
From December 1, 1899, to December 1, 1900	.	.	.	.	.	319,479 37
From December 1, 1900, to December 1, 1901	.	.	.	.	.	320,463 01
From December 1, 1901, to December 1, 1902	.	.	.	.	.	323,500 53
From December 1, 1902, to December 1, 1903	.	.	.	.	.	333,777 34
From December 1, 1903, to December 1, 1904	339,109 27
From December 1, 1904, to December 1, 1905	343,916 00

WATER REGISTRY.

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COMPARATIVE STATEMENT.

	1904.	1903.
UNOBTAINABLE ASSETS		
<i>Received.</i>		
From surplus receipts	\$77. 04	\$10,000 00
From bonds issued		
<i>Expended.</i>		
Construction of reservoirs, land		
concessions, surveys of City	77. 04	\$2,100 00
Balance to credit of Construction		1,000 00
Account		\$10,000 00
UNOBTAINABLE ASSETS		
<i>Received.</i>		
Rate of oil materials	\$2,100 00	\$2,100 00
From bonds issued	12,000 00	12,000 00
From surplus receipts	4,000 00	
	\$17,100 00	\$14,100 00
<i>Expended.</i>		
Balance to credit of materials	\$12,000 00	\$14,100 00
Materials and carting	1,000 00	4,000 00
Balance to credit of Materials	2,000 00	2,000 00
	\$15,000 00	\$18,100 00
		\$22,200 00
UNOBTAINABLE ASSETS		
<i>Received.</i>		
From rate of interest		\$1 00
From sale of bonds		200,000 00
		\$200,001 00
<i>Expended.</i>		
Construction of reservoirs, land		\$200,000 00
concessions, surveys of City		1,000 00
Balance to credit of Construction		\$200,001 00
Account		\$200,001 00
UNOBTAINABLE ASSETS		
<i>Received.</i>		
From rates, fees, etc.	\$200,000 00	\$200,000 00
From surplus and regular account	2,000 00	
From sale of stocks, grain, etc.	1,000 00	
Interest for 1000 appropriated	4,000 00	
Interest for 1000 appropriated		2,000 00
Interest on bonds sold		1,000 00
	\$207,000 00	\$203,000 00
<i>Expended.</i>		
Rate and repairs	\$207,000 00	\$203,000 00
Materials	2,000 00	2,000 00
Work on Fresh Pond	2,000 00	2,000 00
Work on Fresh Pond grating	12,000 00	12,000 00
Water Works Reservoirs	1,000 00	1,000 00
Fresh Pond Reservoirs	1,000 00	1,000 00
Pumping, storage and other as	1,000 00	1,000 00
perman	12,000 00	12,000 00
Water Works Reservoirs	2,000 00	2,000 00
Work on Fresh Pond	12,000 00	12,000 00
Construction of Metropolitan Water	1,000 00	1,000 00
Works	1,000 00	1,000 00
Grants to	1,000 00	1,000 00
Subsidiaries	1,000 00	1,000 00
Building fund	12,000 00	12,000 00
Interest on water debt	12,000 00	12,000 00
Transferred to Construction Ac-		
count	1,000 00	1,000 00
	\$220,000 00	\$220,000 00
Materials and supplies	\$2,000 00	\$2,000 00

In addition to the customary expenditures, there has been paid this year from the receipts for water the following amounts, viz. :—

Metropolitan water	\$28,458 50
Grading at Fresh Pond Reservoir	4,285 50
	<hr/>
	\$32,744 00

If the above unusual expenditures had not occurred, there would have been excess receipts of \$23,000.00.

In addition to the manufactories, business blocks, houses, etc., supplied through meters, water is supplied to 16,270 families, 489 stables, 1,442 horses, 64 cows, 150 shops, 352 offices and stores, by the following fixtures :—

18,728 faucets.	3 hopper closets.
6,865 wash basins.	30 urinals.
9,603 wash tubs.	7 yard hydrants.
6,330 bath tubs.	14 tumbler washers.
123 slop closets.	1,451 hand hose.
16,621 water closets.	5 motors.

Also,

1,031 fire hydrants (besides 19 on private premises).
8 fire reservoirs.
65 street watering standpipes.
28 drinking fountains in public squares.
4 public sanitarries.

The above schedule of fixtures does not include those in school-houses, engine houses, police stations, and other City buildings, or where the use of water is covered by meter.

The usual house-to-house inspection has been made.

Respectfully submitted,

WALTER H. HARDING,
Registrar.



Wasteway at Stony Brook Reservoir

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1905

Uncollected November 30, 1904

Water rates	\$5,670 27	
Supplies and repairs	778 14	
Off and on	150 00	
Scale	8 50	
Maintenance account	412 62	
Construction account	154 98	
	<hr/>	\$7,164 95

Bills placed in the hands of the City
Treasurer for collection from Decem-
ber 1, 1904, to December 1, 1905 —

Water rates	\$3,139 13	
Supplies and repairs	4,094 61	
Off and on	379 00	
Scale	148 00	
Scale	88 73	
Maintenance account	2,914 16	
Construction account	1,271 99	
	<hr/>	\$36,035 64
Total bills		\$36,035 64

There has been collected

Water rates	\$343,795 07	
Supplies and repairs	5,545 81	
Off and on	499 00	
Scale	140 00	
Scale	91 37	
Maintenance account	1,041 64	
Construction account	800 79	
	<hr/>	\$352,812 68
Total collections		\$352,812 68

There has been abated

Water rates, off and on, and scale, sup- plies and repairs, and Construction account	\$2,441 13
--	------------

STATEMENT OF THE WATER REGISTRAR.

There remains uncollected : —

Water rates	\$8,148 39		
Supplies and repairs	1,210 34		
Off and on	168 00		
Seals	5 75		
Maintenance account	2,437 34		
Construction account	627 96		
Rent	8 00		
		<u>\$12,605 78</u>	
Total bills for collection			<u>\$367,503 97</u>
Less abated	\$2,885 33		
Less refunded	1,879 07		
Less unpaid	12,605 78		
		<u>\$17,370 18</u>	<u>\$17,370 18</u>
Net receipts			<u>\$350,133 79</u>

Attest :

WALTER H. HARDING,
Registrar.

CAMBRIDGE, December , 1905.

We have examined the accounts of the Water Registrar and find that they correspond in the amounts collected, abated, refunded, and uncollected with the statement submitted by the City Treasurer and verified by the City Auditor.

Committee on Accounts.

CAMBRIDGE, MASS.,
OFFICE OF THE CITY TREASURER.

To the Cambridge Water Board

I give you herewith a record of the transactions between the Water Board and the City Treasurer's Office during the year ending November 30, 1905.

Trans. receipts for account of Water Works Maintenance.	
Water Rates and Supply Accounts	\$334,007 90
Trans. receipts for account of Water Works - Construction	
Account	3,431 74
Amount certificates received and paid on Water Rates	2,043 20
Refund certificates received and paid on Water Rates	1,079 07
Unexpended bills in my hands November 30, 1905, for account of	
Water Rates Maintenance and Supply Accounts	11 977 03
Unexpended bills November 30, 1905, for account of Construction	677 96

Very respectfully,

WM W DALLINGER,
City Treasurer

I have examined the above statement and find the same correct

HARRY T UPHAM,
City Auditor

REPORT OF THE SUPERINTENDENT OF WATER WORKS

CAMBRIDGE, December, 1905.

To the Honorable Water Board of the City of Cambridge: —

GENTLEMEN:— Complying with the City Ordinance, I herewith submit the annual report of the Superintendent, for the year ending November 30, 1905.

	Gallons.
Total water pumped	2,778,089,640
Total water purchased from Metropolitan Water and Sewerage Board	521,070,000
Total water consumed	3,294,159,640
Quantity of water sold by meter	1,240,569,750
Quantity of water used for sprinkling streets	77,000,000
Quantity of water used for flushing sewers	1,000,000
Quantity of water used for cleaning sanitaries	7,500,000
Quantity of water used for public buildings	33,000,000
Quantity of water used for drinking fountains	35,000,000
Quantity of water used for testing meters	58,000
Quantity of water used for fire purposes	4,000,000

Number of gallons daily for each inhabitant on the total amount consumed, 92.63.

COMPARATIVE STATEMENT OF TOTAL CONSUMPTION DURING THE PAST TEN YEARS.

Date.	Total Yearly Consumption.	Increase or Decrease.	Average Daily Consumption.	Increase or Decrease.	Gallons to each inhabitant daily.	Esti- mated Popu- lation.
1896	2,413,508,557	222,724,665 increase	6,594,280	592,138 increase	75.90	81,643
1897	2,441,340,196	27,833,639 "	6,688,603	94,323 "	76.46	77,480
1898	2,792,321,110	350,980,914 "	7,650,195	961,592 "	85.60	89,376
1899	2,882,570,430	90,249,320 "	7,897,453	247,258 "	87.16	90,807
1900	2,651,277,240	231,293,190 decrease	7,268,773	632,680 decrease	78.69	92,300
1901	2,785,156,440	133,879,200 increase	7,630,566	366,793 increase	80.87	92,716
1902	2,930,553,545	145,397,105 "	8,028,914	398,348 "	85.27	94,153
1903	3,160,704,360	230,150,815 "	8,659,463	630,549 "	89.56	96,626
1904	3,210,982,145	50,277,785 "	8,773,175	113,712 "	89.68	97,822
1905	3,294,159,640	83,177,495 "	9,025,095	251,920 "	92.63	97,426

Total amount of coal consumed	3,100,000 lbs
Amount consumed in 39 days in which Metropolitan Water and Sewerage Board supplied the City	76,000 "
Total amount used for pumping purposes	3,024,000 "
Daily average amount used for pumping purposes (306 days)	11,619 "
Daily average on total amount consumed	9,824 "
Coal consumed per million gallons pumped	1,300 "
Highest water elevation in Fresh Pond was on December 24, 1904	14 10
Lowest water elevation in Fresh Pond was on August 4th	9 00
Average height of water in Fresh Pond	12 91
Highest water elevation in Stony Brook Reservoir was on March 20	42 16
Lowest water elevation in Stony Brook Reservoir was on March 6	39 17
Highest water elevation in Hobbs Brook Reservoir No 1, Lincoln Street, was on March 27th	101 73
Lowest water elevation in Hobbs Brook Reservoir No 1, Lincoln Street, was on September 1st	100 15
Highest water elevation in Hobbs Brook Reservoir No 2, Winter Street, was on March 7th	101 73
Lowest water elevation in Hobbs Brook Reservoir No 2, Winter Street was on December 27, 1904	100 00
Total rainfall at Fresh Pond Pumping Station	33 00
Total rainfall at Stony Brook Reservoir	30 00
Total rainfall at Hobbs Brook Reservoir	37 96

TOTAL RAINFALL FOR THE PAST TEN YEARS

	1895	1897	1898	1899	1900	1901	1902	1903	1904	1905
	in	in	in	in	in	in	in	in	in	in
January	1 00	1 45	4 21	3 40	1 30	1 74	2 71	4 27	7 97	1 00
February	3 00	3 32	4 23	3 40	4 00	1 30	1 97	3 70	3 40	3 47
March	4 00	3 30	3 41	3 30	7 30	7 30	4 30	3 30	3 30	1 00
April	4 27	3 00	3 00	3 30	3 30	4 00	4 30	4 30	3 30	3 30
May	1 70	1 00	4 30	1 30	1 30	4 30	3 30	3 30	3 30	1 00
June	2 00	4 30	3 00	3 30	3 30	4 30	3 30	3 30	3 30	1 00
July	3 00	4 30	4 30	3 30	3 30	4 30	3 30	3 30	3 30	1 00
August	3 00	3 30	7 30	3 30	3 30	4 30	3 30	3 30	3 30	3 30
September	4 30	3 30	1 70	4 30	4 30	3 30	3 30	1 70	3 30	1 00
October	1 30	3 30	7 30	3 30	3 30	3 30	4 30	4 30	1 00	1 00
November	1 30	4 30	4 30	3 30	3 30	3 30	1 30	1 30	3 30	1 00
Total	30 00	61 20	50 02	57 30	60 00	60 30	61 11	64 20	63 00	30 00

FRESH POND AND SURROUNDINGS

Work on the completion of Kingsley Park was resumed this year, and the work has been finished as far as the grading and seeding

The greater part of the planting of shrubs and trees has been done and little now remains to be finished the coming year. I would recom-

mend that the shelters for the look-offs be built this season, according to the plans furnished by French & Bryant.

Also that a drinking fountain and a suitable sanitary be established for the convenience of the people visiting this resort.

There should also be placed a number of park settees for the use of the public.

The Metropolitan water, which was in use at the date of last report, was shut off on December 27th, the Pond gauge reading at the time 16.05, and pumping from the Pond was resumed.

Arrangements having been again made with the Metropolitan Water and Sewerage Board, on August 4th, when the Pond was at elevation 9.69, the water was again let on and continued in use until September 6th, when the Pond had reached elevation 14.41.

The following statement shows the amount of water purchased from the Metropolitan Water and Sewerage Board in 1904 and 1905:—

April, 1904	27,200,000	gallons.
May	274,400,000	"
June	29,940,000	"
November	48,100,000	"
December	251,900,000	"
August, 1905	221,670,000	"
September	47,500,000	"
	<hr/> 900,710,000	"

Price paid for same — \$42,458.50.

The water from the new conduit was let on November 2nd, the Pond level being at the time, 11.86. The level of the Pond on December 2nd, was 12.80, a gain of nearly one foot.

The grass not needed for use of the Department has been sold at auction.

Average height of the Pond for the year has been 12.91 feet.

I would recommend that the next work undertaken at the Pond be the finishing of the roadway on the westerly side of the Pond leading from Huron Avenue to the corner of Washington Street. This roadway is completed to sub-grade and with the exception of the entrance from Huron Avenue very little heavy grading would need to be done. The great part of the expense would be the surfacing of the roadway.

The grounds, roadways and walks about the Pond have received the usual care.



Inlet of Stony Brook Main at Fresh Pond

FRESH POND RESERVOIR.

				TOTALS GATE.			
				This gate has been closed daily for one half hour in the morning and one half hour in the afternoon i. e. 9 a. m. to 9.30 a. m. and 4 to 4.30 p. m. for the purpose of expelling the air from the Muddy Brook main.			
				1 inch opening		20 inch opening	
				(Type)		(Type)	
				During entire month, 20 turns		During entire month, 20 turns	
1904							
December	1	12.95					
December	20		14.10	1.20			
1905							
January	4		13.97				
January	21	14.14		2.47			
February	1		14.20				
February	20	13.08		1.00			
March	9		13.00				
March	21	13.20		2.24			
April	7		13.43				
April	20	12.14		2.07			
May	1		13.00	May 6, closed for 2 hours		May 6, closed for 2 hours	
May	21	11.20		1.20			
June	8		11.97				
June	20	11.11		4.41		During entire month, 20 turns	
July	1		11.10				
July	21	9.73		1.20			
August	4	9.40					
August	21		13.10	3.08			
September	1	12.20					
September	4		14.41	3.97			
October	1	12.20		October 3, closed at 1 p. m.		October 3, closed at 1 p. m.	
October	21		11.05	1.20		October 6, opened at 1.30 p. m.	
November	1	11.10		October 20, closed at 1 p. m.		October 20, closed at 1 p. m.	
November	20		12.10	1.04			
				22.40			

PUMPING STATION AND GROUNDS

The buildings and grounds are in good condition and have required no repairs this year.

The engines and boilers are in good condition. A new set of grate bars have been furnished No. 2 boilers.

The usual repairs have been made by the regular force at the station.

The Leavitt engine has pumped all the water used from the Pond and has never performed its work as satisfactorily as during the past year.

The Chief Engineer's report is appended.

ENGINE NO. 7.			Total Water Pur- chased from Metro- politan Water and Sewerage Board.	Total Water Consumed.	Daily Average Water Consumed.	Total Coal Consumed.	Daily Average Coal Consumed.	Average Height of Pond.	Rainfall.	
Running Time.		Total Water Pumped.								
1904.	Hrs.	Min.	Gallons.	Gallons.	Gallons.	Gallons.	Lbs.	Lbs.	Feet.	Ins.
December..	66	30	50,150,120	251,900,000	302,059,120	9,743,840	107,640	12,972*	14.74	1.92
1905.										
January...	389		295,083,800		295,083,800	9,515,832	379,550	12,243	15.52	3.47
February...	363	30	288,451,680		288,451,680	10,301,845	370,990	13,249	14.13	1.09
March	370		278,379,200		278,379,200	8,979,974	359,795	11,606	13.25	2.52
April	345	30	263,017,040		263,017,040	8,767,234	339,100	11,303	13.22	2.87
May.....	374		284,889,880		284,889,880	9,189,996	351,100	11,326	12.43	1.30
June	348		263,732,040		263,732,040	8,791,668	326,750	10,891	11.49	4.41
July	415		291,765,320		291,765,320	9,411,784	350,300	11,300	10.41	1.86
August....	39		25,396,120	221,670,000	247,066,120	7,969,871	72,575	9,650*	11.32	3.06
September	284	30	216,206,320	47,500,000	263,706,320	8,790,210	285,400	11,056*	13.36	5.97
October....	355	15	272,439,640		272,439,640	8,788,379	336,100	10,842	12.41	1.30
November.	317	30	243,569,480		243,569,480	8,118,982	310,300	10,343	12.24	2.91
Total			2,773,089,640	521,070,000	3,294,159,640	9,025,095	3,589,600		12.91	32.68

* Average daily coal used while pump was in use.

OPERATING EXPENSES AT PUMPING
STATION.

Advertising	\$9 50
Building repairs	151 04
Carpentry	10 08
Disinfectants	2 00
Electrical work and supplies	102 78
Engine and boiler repairs and supplies	206 69
Expressage	7 53
Fuel	5,983 08
Grates	273 33
Hardware, tools and repairs	249 35
Ice	15 60
Lumber	7 08
Oil, waste and packing	426 80
Painting	3 40
Sealer of weights and measures	1 64
Telephone	81 30
Wall repairs	44 00
	<hr/>
	\$7,575 20
Salaries and labor	7,485 72
	<hr/>
	\$15,060 92

THE FORTY INCH STEEL DISTRIBUTING MAIN

No leaks have occurred on this main during the year. The portions across the railroad tracks and over the cut at Holworthy Street should be scraped and painted the coming season.

PAYSON PARK RESERVOIR

The grounds about the Reservoir have received a coat of dressing where needed and are in good condition.

The stone and brick work of the gate house has been thoroughly repointed and the wood work painted and the building is now in first-class condition.

The former keeper, Alfred Mason, who had been in charge at the Reservoir since its completion, died last August and T. J. Rengan has been appointed by the Board in his place.

PIPE YARD

The dwelling house at the Yard should be shingled this year.

The sheds are also in bad condition, needing shingling and new sills under a portion of them.

I would recommend that storage sheds be built this year along the westerly line of the lot, these are very much needed as a large part of our stock cannot be properly stored at present. We have on hand from the pipe line a large amount of material that can be used for this purpose to great advantage.

HIGH SERVICE

Following is the list of streets supplied from the high service: -

Agassiz Street	Holy Avenue
Appleton Street from Highland Street to Bay and Hutchinson Street	Humboldt Street
Arlington Street	Huron Avenue from Appleton Street to Raymond Street
Avenue Hill Street	Lancaster Street
Baker Street	Lansdown Street
Baker Avenue	Mount Pleasant Street
Baker Avenue West	Raymond Street from Lansdown Street to Walker Street
Baker Vista Park	Reservoir Street from Highland Street
Canford Avenue from Huron Avenue to Nottingham Street	Upland Road from Nicholas Avenue to Huron Avenue
Carleton Street from Huron Avenue to Lansdown Street	Vandal Lane from Huron Avenue
Highland Street from Reservoir Street to Appleton Street	Violet Street
McGee Avenue	Walton Avenue
	Washington Avenue

LIST OF CHECK VALVES IN USE.

Appleton Street at Hutchinson Street.
Avon Hill Street and Linnaean Street.
Concord Avenue at Buckingham Street.
Garden Street and Linnaean Street.
Raymond Street and Linnaean Street.
Upland Road near Mount Vernon Street.
Vincent Street at Walden Street.

LEAKAGE.

The total number of leaks for the year was two thousand one hundred ninety-one (2,191).

The following leaks were reported to and cared for by the Department : —

Two hundred four (204) on supplies.
Two (2) on hydrants.
Four (4) on gates.
Three (3) on street watering standpipes.
Five (5) on four-inch main pipes.
Nine (9) on six-inch main pipes.
Seven (7) on eight-inch main pipes.
One (1) on twelve-inch main pipe.
One (1) on twenty-four-inch main pipe.
One (1) on thirty-inch main pipe.
Total, two hundred thirty-seven (237).

Fourteen (14) of the leaks of the above statement were caused by electrolysis and thirteen (13) were caused by the Sewer Department construction.

The supplies on which forty-one (41) leaks occurred were renewed.

The Inspectors on the canvass discovered nineteen hundred fifty-four (1,954) leaks classified as follows : —

Sixteen hundred four (1,604) on water closets.
Three hundred thirteen (313) on faucets.
Sixteen (16) on tanks.

Nineteen (19) on supplies.

Two (2) on water valves.

These leaks were repaired by the owner of premises.

The leak on the old pumping main at the corner of Huron Avenue and Fayerweather Street has been to date, an expense of one thousand twenty two dollars and ninety five cents (\$1,022.95). This amount does not include the claims for damages that are pending.

Total leaks during the past five years

1901	2,308
1902	2,339
1903	2,391
1904	2,114
1905	2,191

TABLE SHOWING GAIN IN THE TOTAL CONSUMPTION FOR THE YEAR 1905 OVER THE YEAR 1904

	Total Consump- tion 1905	Total Consump- tion 1904	Increase	Decrease
1904				
December	222,000,129	173,365,000	48,635,129	
1905				
January	176,000,000	204,000,000		28,000,000
February	200,000,000	200,000,000		0,000,000
March	170,000,000	200,000,000		30,000,000
April	200,000,000	200,000,000		0,000,000
May	200,000,000	200,000,000		0,000,000
June	200,000,000	200,000,000		0,000,000
July	200,000,000	200,000,000		0,000,000
August	200,000,000	200,000,000		0,000,000
September	200,000,000	200,000,000		0,000,000
October	200,000,000	200,000,000		0,000,000
November	200,000,000	200,000,000		0,000,000
Total	1,800,000,000	1,800,000,000	0,000,000	

MAIN PIPE

A new twelve inch main pipe has been laid from the canal bridge in First Street through the new location of same street and up through Main Street on the north side towards the junction of Broadway. This pipe in Main Street is to take the place of the old eight inch line which was laid in 1871.

A new line of eight inch pipe has been laid on the south side of Main Street from Wadsworth Street to near the Parkway.

These new mains are connected together at the end near the West Boston Bridge.

The tables of main pipes will be found on pages 43 and 53.

Following are the streets in which the main pipes have been renewed :

In Chestnut Street from Magazine Street to Pearl Street, four hundred seventy (470) feet of six-inch have been laid ; the original pipe in this location was of four-inch and laid in 1871 and 1872.

In Greenough Avenue from Ellsworth Avenue to Highland Avenue, three hundred sixty (360) feet of four-inch pipe have been laid. The old four-inch pipe formerly supplying this vicinity was laid in 1875, 1876, 1881.

In Huron Avenue from Lake View Avenue to Lexington Avenue, the old four-inch main laid in 1888 and 1889 has been removed and three hundred fifty-six (356) feet of six-inch pipe laid.

In Tremont Street from Cambridge Street, north, the old four-inch pipe laid in 1869, has been removed and four hundred sixty-eight (468) feet of six-inch pipe laid in its place.

The annual blowing off of main pipes in all sections of the City has been of great benefit in improving the quality of the water.

The usual number of complaints of the disturbed condition of the water have been remedied during the year — outside of the annual blowing off.

In sixteen (16) locations the blow-offs have been reset.

In the several streets where the Sewer Department has constructed sewers, the main pipes have been offset and in cases where there were abandoned mains, they have been removed for the accommodation of the sewer locations.

The improvement of Broad Canal by the Charles River Dam Commission makes necessary the changing of the water mains now crossing at First, Third and Sixth Streets.

The water pipes are now laid in the mud and are of smaller sizes than are desirable in view of the future growth of the City and the fact that the section supplied is largely manufacturing.

As electrolysis may very seriously affect these submerged pipes, I would recommend that tunnels be constructed at these points and that the pipes be laid in them. I have no doubt but that the Cambridge Gas

One hundred twenty-one (121) supplies were laid of galvanized wrought iron pipe in sizes from three-quarter-inch to two-inch inclusive and nine (9) were of cast-iron pipe and were located as follows:—

6-inch for Blanchard Machine Co., State Street.
 8-inch for Boston & Maine, Bridge Street.
 6-inch for Cambridge Gas Light Company, Athenaeum Street.
 6-inch for Ginn & Company, Athenaeum Street.
 6-inch for Edward C. Sherburne
 6-inch for Memorial Hall, Cambridge Street.
 4-inch for Stillman Infirmary, Mount Auburn Street.
 6-inch for Ward-Corby Company, Albany Street.
 6-inch for Warren Brothers, Potter Street.

Seven (7) supplies were laid for the temporary use of the Sewer Department. They have been removed and are not included in the above list.

As requested from time to time during the year, the Sewer Department has been accommodated by offsetting supplies where they have conflicted with the construction of the sewers.

On account of the change in the lines and resurfacing of Main Street, the supplies have been renewed from the new main to the property lines.

One hundred seventy-six (176) supplies have been renewed in locations where the original supply was inadequate, leaking or too old for further use. In addition to these, the supplies, as designated in the following streets, were renewed as the main pipe in street was renewed or by request of Street Department which was constructing new street surface:—

Cambridge Street	.	.	.	.	12
Chestnut Street	.	.	.	.	3
Concord Avenue	.	.	.	.	13
Greenough Avenue	.	.	.	.	6
Huron Avenue	.	.	.	.	2
Lambert Street	.	.	.	.	19
Orchard Street	.	.	.	.	5
Putnam Avenue	.	.	.	.	9
Tremont Street	.	.	.	.	22
Union Place	.	.	.	.	4
Warren Street	.	.	.	.	22



Hobbs Brook at Hobbs Brook Reservoir

Total number of supplies renewed during the year was two hundred ninety three (293).

(One hundred seventy seven (177) service boxes have been set on old supplies.

The service boxes on supplies in all parts of the City were inspected in the Spring as usual and as necessary were raised or lowered. Outside of this annual inspection in sixty seven (67) cases, the service boxes have been changed to conform to the sidewalk elevation.

Seventy two (72) supplies were thawed out by the Department last Winter and Spring.

Following is the list of establishments having fire protection from the City of Cambridge.

American Rubber Co.,	Binney Street,	Two 6 in.
American Net & Twine Co.,	Third Street,	Two 6 in.
American Net & Twine Co.,	Third Street,	6 in.
American Vulcanized Fibre Co.,	Tannery Street,	3 in.
Barber Asphalt Paving Co.,	First Street,	6 in.
Bay State Metal Works,	Harvard Street,	6 in.
Blakher & Shepard,	Auburn Street,	3 in.
Blake, George F. Manufacturing Co.,	Binney Street,	6 in.
" " " " " "	Third Street,	6 in.
Blanchard Machine Co.,	State Street,	6 in.
Boston Book Binding Co.,	Mt. Auburn Street,	6 in & 4 in.
Boston Elevated Railway Co.,	Haldwin Street,	3 in & 6 in.
" " " " " "	Cambridge Street,	Two 3 in.
" " " " " "	Pelham Street,	Three 6 in.
" " " " " "	Massachusetts Avenue,	6 in.
" " " " " "	Mt. Auburn Street,	6 in & 3 in.
" " " " " "	Murray Street,	6 in.
" " " " " "	River Street,	6 in.
Boston & Maine Railroad,	Bridge Street,	6 in.
" " " " " "	Bridge Street,	6 in.
" " " " " "	East Street,	6 in.
" " " " " "	Lyons Point Street,	6 in.
Boston Woven Hose & Rubber Co.,	Portland Street,	Two 6 in.
Cambridge Gas Light Co.,	Third Street,	6 in.
Cambridge Electric Light Co.,	Western Avenue,	6 in.
Cambridge Laundry,	Kinnaird Street,	6 in.
Cambridge Mutual Fire Insurance Co.,	Massachusetts Avenue,	3 in.
Chelmsford Foundry Co.,	Portland Street,	3 in.
Dover Stamping Co.,	Pleasant Street,	6 in.
Ginn & Co.,	First Street,	Two 6 in.
" " " " " "	Athenaeum Street,	6 in.
Gropper Bros.,	Ninth Street,	1 & 3 in.
Harvard University,	Harvard Lane, Harvard St.,	6 in.
" " " " " "	Memorial Hall, Cambridge St.,	6 in.
" " " " " "	Observatory, Concord Ave.,	6 in.
" " " " " "	Smiths Museum, Nuttall Ave.,	6 in.

University Press,	Nutting Place,	6 in
Ward, Corby Co.,	Albany Street,	6 in
Warren Iron,	Potter Street,	6 in
Westmore, C. D.	Claverly Hall, Mt. Auburn St.,	6 in
Whittemore Brothers,	Albany Street,	6 in

DRINKING FOUNTAINS

The number of drinking fountains and troughs remains unchanged, *i. e.*, twenty-eight (28).

Of the above number, four (4) are of the Jenks manufacture and are ice water drinking fountains. These were supplied with ice at an expense to the Water Department, from June 15th to October 24th, inclusive, as follows:

Central Square fountain	\$129.90
East Cambridge fountain	125.55
Harvard Square fountain	103.43
North Cambridge fountain	135.70
	<hr/>
	\$494.58

Average cost per day of supplying ice (132 days) for these fountains was per fountain, 94 cents.

In response to the calling the Department's attention to acts of 1902 by the Cattle Bureau of State Board of Agriculture, the fountains and troughs have been carefully watched and cleaned.

In all sections of the City the fountains have been painted and the usual and necessary repairs made.

STREET WATERING STANDPIPES

Sixty-five (65) street watering standpipes are in use at this date, November 30, 1905.

Thirty-nine (39) standpipes have been repaired during the year.

The cost of these repairs has been met by the Street Watering Department, as has been the custom in previous years.

GATES

Twenty-seven (27) new gates have been set during the year (see recapitulation table, page 54).

Seven (7) have been placed on renewal of main pipe.

Sixteen (16) have been placed on new mains (extensions).

Four (4) have been placed on supplies.

The gates have been given their annual inspection and found in good condition.

Their locations have been carefully marked.

BOXES.

There have been eighty-seven (87) boxes set this year.

Twenty-one (21) iron and two (2) small wooden have been set on extensions and renewals of main pipe.

Five (5) special wooden and thirteen (13) Merrill boxes have been set on meters.

Ten (10) iron boxes have been set on new supply work.

Two (2) flush hydrants, two (2) wooden and thirty-two (32) iron boxes have been set in place of worthless ones removed.

The gate boxes in all parts of the City have been inspected and repaired.

Upon request by Street Department or as changes in street grades have required, the boxes have been raised or lowered to conform to new elevation.

This care has also been given to those that have been affected by frost.

HYDRANTS.

Total number of hydrants in use at this date, November 30, 1905, is one thousand thirty-one (1,031).

Boston	156
Chapman	567
Coffin	41
Flush	87
Holyoke	89
Perkins	91
	<hr/>
	1,031

Twenty-eight (28) hydrants have been set during the year: Thirteen (13) in new locations and fifteen (15) in place of old or disabled ones removed.

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Hobbs Brook, showing condition of Banks

One flush hydrant has been removed from East Street as it will be no longer needed there. Flush hydrants have been removed from the streets following: --

Cambridge Street at Massachusetts Avenue
East Street.
Everett Street (2).
Kirkland Street at Baldwin Street.
Kirkland Street at Oxford Street.
Kirkland Street at Trowbridge Street.
Main Street (117).
Main Street at First Street.
Massachusetts Avenue at Arlington Street.
Tremont Street at Cambridge Street.

Post hydrants have been removed from the streets following:

Concord Avenue at Craigie Street (Holyoke).
Front Street near Forest Street (Boston).
Hampshire Street at Page Box Company (Coffin).
Prison Point Street (Boston).

In fourteen (14) locations the post hydrants have been repaired.

In Cedar Street, Sargent Street, Tannery Street and Trowbridge Street the hydrants have been relocated.

There have been two Chapman hydrants sold to and set for the Cambridge Gas Light Company on its premises on Second Street.

The need of uniformity in hose couplings of hydrants has recently been emphasized in the great fires at Baltimore and Rochester.

Our hydrants have always had the 3-inch connection instead of the 2½-inch which has been adopted by the following associations interested:

American Water Works Association.
National Fire Protection Association.
National Board of Fire Underwriters.
Committee of the National Board of Fire Underwriters.
New England Water Works Association.
National Firemen's Association.
International Association of Fire Engineers.

Our Chief of Fire Department has urged in his report the change, and I would recommend that in future all hydrants purchased be fitted with the standard outlets and that the hydrants in use be changed as rapidly as possible.

METERS.

Three hundred forty-six meters have been set this year in locations which were not covered by meter on November 30, 1904, as follows:—

	2 inch.	1 1/2 inch.	1 inch.	3/4 inch.	5/8 inch.	Total.
Crown.....	.....	.....	1	2	.....	3
Hersey	1	.....	4	11	21	37
Lambert.....	.....	.....	.....	1	3	4
Nash.....	.....	.....	.....	1	.....	1
Trident.....	.....	1	2	9	12	24
Union Rotary.....	2	1	.....	.....	.....	3
Worthington.....	2	4	7	30	231	274
	5	6	14	54	267	346

Total number of meters in use on domestic supplies, churches and manufactories, at this date, November 30, 1905, is twenty-eight hundred eighty-six (2,886).

	6 inch.	4 inch.	3 inch.	2 inch.	1 1/2 inch.	1 inch.	3/4 inch.	5/8 inch.	Total.
Ball & Flitts.....	.....	.....	.....	.....	.....	1	.....	.....	1
Crown.....	.....	2	.....	7	4	6	15	9	43
Empire.....	.....	.....	.....	.....	.....	2	.....	.....	2
Gem.....	1	.....	.....	.....	.....	.....	.....	.....	1
Hersey.....	1	1	4	21	15	118	290	743	1,193
Keystone.....	.....	.....	.....	.....	.....	.....	.....	57	57
Lambert.....	.....	.....	.....	.....	.....	5	34	92	131
Nash.....	.....	.....	.....	.....	.....	.....	.....	13	13
Thomson.....	.....	.....	.....	.....	1	.....	3	5	9
Trident.....	.....	.....	5	14	21	104	235	374	753
Union Rotary.....	1	9	7	15	11	2	10	12	67
Worthington.....	.....	2	4	15	16	40	70	469	616
	3	14	20	72	68	278	657	1,774	2,886

And forty-eight (48) in public buildings, for which the Department receives no income.

These meters are placed on the buildings in use by the City, *i. e.*, schools, engine houses, stations, etc., in order to determine the amount of water used for such purposes:—

	7 inch	11 1/2 inch	1 inch	3 1/2 inch	5 1/2 inch	Total
Ball & Pipe						
Clower	1		1			2
Barrow						
Trident			10	1		11
Thompson		1				1
Edison Battery	1					1
Washington				1		1
	1	1	10	1	1	14

STONY BROOK PIPE LINE.

That portion of this line from Fresh Pond to Irving Street in Watertown where the new concrete conduit begins has been out of use since November 2nd and the air ejector at Holworthy Street has been removed. The rest of the line has developed no leaks and is apparently in good condition.

The air valves have been opened frequently and everything done possible to keep the flow up to the maximum.

Readings from the Venturi meter have been taken monthly.

The gate house at the 36-inch blow-off is in bad condition. I would recommend that it be covered with galvanized iron for protection.

STONY BROOK.

Four new cesspools have been constructed during the year, making twenty-seven cesspools and eighteen vaults now cared for by this Department.

The water in this basin has been kept as high as thought safe during the past year, in order that the flow to Fresh Pond might be as large as possible.

HOBBS BROOK.

The keeper's house at the basin will need painting this year. A bathroom has been supplied the past season and water from the well brought into the house.

All standing grass not needed has been sold as in former years.

The buildings on the Evan's farm, which were sold last year, have been removed.

The bridge at the Lincoln Street dam has been replanked.

The average elevation of water in this basin for the past year has been 181.30 feet, the highest, 181.75 feet, and the lowest, 180.15 feet.

HOBBS BROOK.

[illegible]

RECAPITULATION

NEW SUPPLIES

	0	0	0	0	1	1	1	1	Total
	inch	inch	inch	inch	inch	inch	inch	inch	
Length in feet of pipe	94	981	294	171	471	171	1,001	2,207	4,356
Number of tees	1	7	1	5	7	0	20	75	110
Number of gate and waste valves				5	1	0	20	75	110
Number of cross tees				5	1	0	21	71	110
Number of elbows						0	20	20	40
Number of gate valves	1	0	1						2
Number of gate tees									10

MAIN PIPE

	12	10	0	0	0	1	1	Total
	inch	inch	inch	inch	inch	inch	inch	
Length in feet of pipe	120	24	1,721	1,200	200	100	110	3,475
Length in feet of pipe renewed	175		1,200	1,200	200	100	110	3,085
Total length in feet of pipe	295	24	2,921	2,400	400	200	220	6,560
Number of gates	1		1	11	0			13
Number of hydrants								20

TABLE SHOWING NUMBER OF GALLONS, BY THE MONTH, FLOWING OVER THE WATERWAY AT STONE BRIDGE BASIN

	Gallons	Number of Days		Gallons	Number of Days
1904			May	121,700,000	30
December	200,000	1	June	107,000,000	30
			July	200,000	1
1905			August		
January	251,000,000	30	September	200,000,000	17
February	200,000,000	2	October		
March	1,753,000,000	31	November		
April	1,400,000,000	30		2,100,000,000	100

Total amount wasted 2,149,200,000 gallons

Total amount of days in which water wasted 140

COMPARATIVE TRENCHING FOR THE PAST TEN YEARS

	Extensions	Replacements	Repairs	Total Feet	Miles
1900	17,021	20,042	17,021	54,084	11.50
1901	17,021	20,042	17,021	54,084	11.50
1902	17,021	20,042	17,021	54,084	11.50
1903	17,021	20,042	17,021	54,084	11.50
1904	17,021	20,042	17,021	54,084	11.50
1905	17,021	20,042	17,021	54,084	11.50
1906	17,021	20,042	17,021	54,084	11.50
1907	17,021	20,042	17,021	54,084	11.50
1908	17,021	20,042	17,021	54,084	11.50
1909	17,021	20,042	17,021	54,084	11.50
1910	17,021	20,042	17,021	54,084	11.50

PUMPING STATION,
CAMBRIDGE WATER WORKS,

December 1, 1905.

Edwin C. Brooks, Superintendent, Cambridge Water Works : —

DEAR SIR : — I would report that the Leavitt Engine has pumped the water for the year with the exception of the Metropolitan supply. The Fort Wayne dynamo, which was repaired, and the new grates in No. 2 boiler have given good satisfaction.

The employees at the station have made all the needed repairs, which were considerable, during the time the City was using Metropolitan water.

Respectfully submitted,

WILLIAM H. BLAISDELL,
Engineer.

SUMMARY OF STATISTICS

FOR THE YEAR ENDING NOVEMBER 30, 1905.

As form recommended by the New England Water Works Association

CAMBRIDGE WATER WORKS

CITY OF CAMBRIDGE, COUNTY OF MIDDLESEX, STATE OF MASSACHUSETTS.

GENERAL STATISTICS

Population by census of 1900 91,886

Date of construction 1835

By whom owned City of Cambridge

Source of supply Hobbs Brook and Stony Brook in Lincoln, Waltham and Weston, and Fresh Pond in Cambridge

Mode of supply Gravity from Hobbs and Stony Brooks to Fresh Pond, pumping from Fresh Pond to Payson Park Reservoirs, thence by gravity to consumers

PUMPING STATISTICS

1 Builders of pumping machinery One Leavitt built by Girshon High Duty Pumping Engine Company, two Worthington, one Blake

2 Description of fuel used — a Kind bituminous

b Brand of coal Quonahoning

c Price of coal per gross ton delivered from December 1, 1904, to November 30, 1905, \$3.75 and \$4.00

3a Coal consumed for the year 3,589,640 lbs

b Coal consumed for pumping purposes only 3,491,195 lbs

4 Pounds of wood consumed 3 equivalent amount of coal, 200 lbs

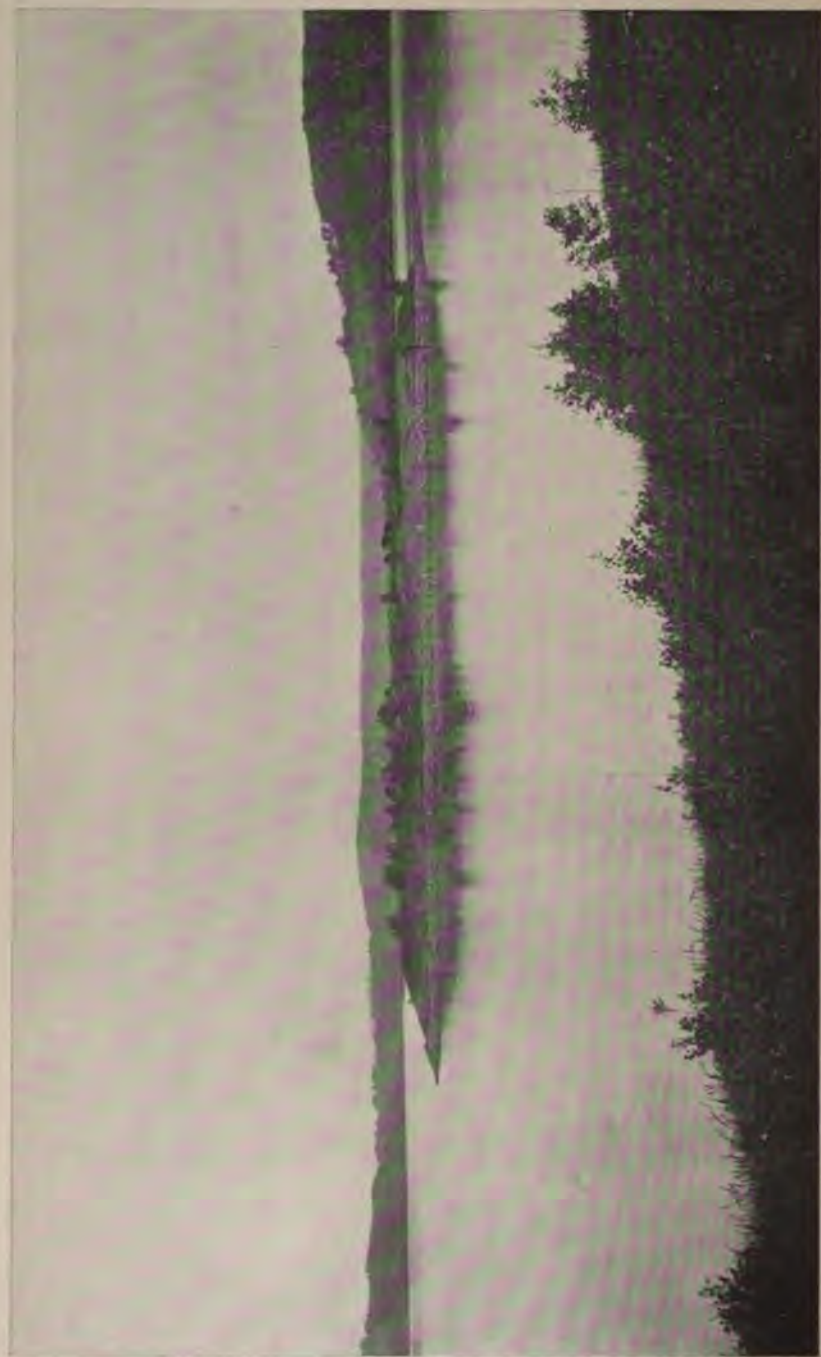
5 Total equivalent coal consumed for the year for pumping purposes $M + (4)$, 3,491,695 lbs

SUMMARY OF STATISTICS.

	Gallons.
6a. Total pumpage for the year without allowance for slip	2,773,089,640
6b. Total amount purchased from Metropolitan and Sewerage Board	521,070,000
6c. Total consumption for the year	3,294,159,640
7. Average static head against which pumps work —	158.03 feet.
8. Average dynamic head against which pumps work —	194.44 feet
9. Number of gallons pumped per pound of equivalent coal (5) —	793.
10. Duty = $\frac{2,773,089,640 \text{ gals. pumped} \times 8.34 (\text{lbs.}) \times 100 \times \text{dynamic head, } 194.44}{\text{Total fuel consumed, } 3,494,695}$	181,987,543
Cost of pumping, figured on pumping station expenses, viz:	
\$15,060.92.	
11. Per million gallons pumped —	\$5.43.
12. Per million gallons raised one foot (dynamic) —	.028.

FINANCIAL STATISTICS FOR 1904.

Ordinary receipts	\$5,417 50	
From consumers	345,795 07	
Abatements	2,885 33	
Construction account	800 28	
		\$354,898 18
EXPENDITURES.		
Total Maintenance:		Operating Expenses.
General expenses	\$22,404 95	\$22,404 95
Supply expense	3,416 35	
Salaries	10,499 00	10,499 00
Salaries, pumping	7,485 72	7,485 72
Pumping, general expense	7,575 20	7,575 20
Payson Park Reservoir	1,483 09	1,483 09
Fresh Pond Reservoir, general	11,799 28	2,730 00
Fresh Pond Reservoir, grading	4,285 50	
Hobbs Brook Reservoir	1,756 71	1,756 71
Stony Brook Reservoir	2,195 21	2,195 21
Ice	484 29	
Rent	1,200 00	1,200 00
Metropolitan Water and Sewerage Board	28,458 50	
Amount carried forward	\$103,043 80	\$57,329 88



General View of Hobbs Brook Reservoir

<i>Amount brought forward</i>	\$103,043 80	
Interest on bonds	135,806 80	
Sinking fund	121,522 50	
Refunds and abatements	4,761 40	
		\$361,132 50
<i>Construction</i>		
General	\$14,541 14	
Hobbs Brook, land	1,628 10	
Hobbs Brook, general	63 22	
Hobbs Brook conduit	226,237 47	
City Solicitor	500 00	
Stony Brook main	3,919 13	
Meters	4,343 51	
		\$251,232 57
Cost of works to date	\$6,023,739 70	
Rounded debt at date	3,646,690 00	
Value of Sinking Fund at date	1,382,828 84	
Average rate of interest	3½ and 4 per cent.	

STATISTICS OF CONSUMPTION OF WATER

- 1 Estimated total population at date 97,426
- 2 Estimated population on lines of pipe 97,426
- 3 Estimated population supplied 97,426
- 4a Total pumping for year — 2,773,082,640 gallons
- 4b Water purchased from Metropolitan and Sewerage Board — 521,070,000 gallons
- 4c Total consumption for the year 3,294,152,640 gallons
- 5 Passed through meters 1,240,569,750 gallons
- 6 Percentage of consumption metered 37.6 per cent.
- 7 Average daily consumption 9,025,005 gallons
- 8 Gallons per day to each inhabitant 92.63
- 9 Gallons per day to each consumer 92.63
- 10 Gallons per day to each tap 694
- 11 Cost of supplying water, per mil. on gallons pumped, figured on total maintenance operating expenses \$2.067
- 12 Total cost of supplying water per million gallons pumped figured on total maintenance + interest on bonds

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

Kind of pipe — cast iron.

Sizes — From 2-inch to 40-inch.

Extended — 5,817 feet during year.

Renewed — 2,263 feet during year.

Total now in use — 126.72 miles.

Number of leaks per mile — 18.

Length of pipes 2 and 3 inches diameter — 2 miles.

Number of hydrants added during year (public) — 13.

Number of hydrants (public) now in use — 1,031.

Number of stop gates added during year — 23.

Number of stop gates smaller than 4-inch — none.

Range of pressure on mains — 45 lbs. to 55 lbs.

SERVICES.

Kind of pipe — galvanized iron.

Sizes — Three-fourth inch to two inches of galvanized wrought iron pipe. 3-inch, 4-inch, 6-inch and 8-inch of cast iron pipe.

Extended — 6,251½ feet.

Estimated total now in use — 116.34 miles.

Number of service taps added during year — 121—¾-inch to 2-inch; one 4-inch; seven 6-inch; one 8-inch.

Number now in use — 14,933.

Average length of service — 44 feet (for the year).

Average cost of service for the year — \$18.38.

Number of meters added — 346.

Number now in use — 2,886.

Percentage of services metered — 19.

Respectfully submitted,

EDWIN C. BROOKS, *Superintendent.*

The following statement is from the report of the Commissioners of the Sinking Fund of the City of Cambridge, and shows the present condition of the Water Loan Sinking Fund

In

The amount of the Fund November 30, 1904, was	\$1,310,606 74
The amount received from the City Treasurer of Cambridge being the annual requirements for 1905 derived from Water Rates was	191,573 30
Interest received on invested funds	44,530 81
	<u>\$1,546,710 85</u>

On

Paid accrued interest on investments purchased	\$807 16
Paid premiums on investments purchased	933 03
Leaving the amount of the fund November 30, 1905	<u>1,544,970 66</u>
	\$1,544,970 66

The funded Water Debt, which the foregoing Fund is to pay mature as follows

Nov 1 1906	3 1-2s	\$45,000 00
Oct 1 1907	do	50,000 00
Nov 1 1907	do	75,000 00
July 1 1908	do	64,000 00
Aug 1 1908	do	75,000 00
July 1 1909	do	90,000 00
May 1 1910	do	200,000 00
July 1 1910	do	75,000 00
Sept 1 1910	do	150,000 00
Jan 1 1911	do	50,000 00
Oct 1 1911	do	25,000 00
Jan 1 1912	do	150,000 00
Mar 2 1912	do	75,000 00
Nov 1 1912	do	65,000 00
Feb 1 1913	do	100,000 00
Aug 1 1913	do	50,000 00
April 1 1913	do	200,000 00
Aug 1 1913	do	200,000 00
April 1 1914	do	100,000 00
July 1 1914	do	200,000 00
Aug 1 1914	do	100,000 00
Oct 1 1914	do	245,000 00
April 1 1915	3 1-2s	200,000 00
July 1 1915	3 1-2s	100,000 00
Nov 1 1915	3 1-2s	75,000 00
Dec 1 1915	3 1-2s	100,000 00
May 2 1916	3 1-2s	50,000 00
Amount carried forward		<u>\$2,530,000 00</u>

WATER LOAN SINKING FUND.

<i>Amount brought forward</i>						\$2,839,100 00
June 1, 1918	.	.	3 1-2s	.	.	60,000 00
Nov. 1, 1918	.	.	3 1-2s	.	.	50,000 00
Nov. 1, 1919	.	.	3 1-2s	.	.	23,000 00
Nov. 1, 1920	.	.	3 1-2s	.	.	30,000 00
July 1, 1921	.	.	3 1-2s	.	.	30,000 00
July 1, 1922	.	.	3 1-2s	.	.	18,500 00
Nov. 1, 1922	.	.	3 1-2s	.	.	5,000 00
April 1, 1924	.	.	4s	.	.	300,000 00
May 1, 1925	.	.	3 1-2s	.	.	46,000 00
May 1, 1936	}	20 serial bonds, one bond of				250,000 00
to		\$12,500. to be paid each year,				
May 1, 1925		from the receipts from rates				
						<hr/> \$3,646,600 00



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